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Tahara

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(54) **SHEET FEED APPARATUS, AND IMAGE FORMING APPARATUS AND IMAGE READING APPARATUS INCLUDING THE SHEET FEED APPARATUS**

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B65H 1/04	(2006.01)
B65H 3/52	(2006.01)
B65H 3/32	(2006.01)
B65H 5/06	(2006.01)

(52) **U.S. Cl.**

CPC ***B65H 3/0684*** (2013.01); ***B65H 1/04*** (2013.01); ***B65H 3/32*** (2013.01); ***B65H 3/5223*** (2013.01); ***B65H 5/062*** (2013.01); *B65H 2405/324* (2013.01); *B65H 2801/06* (2013.01)

(58) **Field of Classification Search**

CPC B65H 2404/2532; B65H 2404/551; B65H 2404/5511; B65H 2601/324

See application file for complete search history.

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(57) **ABSTRACT**

In a sheet feed apparatus, sheet feed roller is provided in casing so as to face downstream side of sheet stacking portion in sheet conveying direction, and conveys sheets in sheet conveying direction. Separation pad is provided facing sheet feed roller, forms, with sheet feed roller, nip portion through which sheets pass, and conveys sheets one by one in sheet conveying direction. Holder fixes and supports separation pad. Mount portion mounts holder. An urging member urges separation pad toward sheet feed roller via the holder. Holder is changeable in its posture between a first posture in which separation pad is spaced apart from sheet feed roller so as to release nip portion having been formed therebetween, and a second posture in which nip portion is formed between separation pad and sheet feed roller. Holder includes a contact part that contacts the mount portion in the second posture.

16 Claims, 16 Drawing Sheets

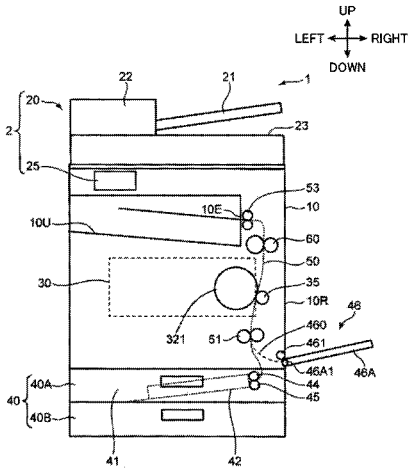
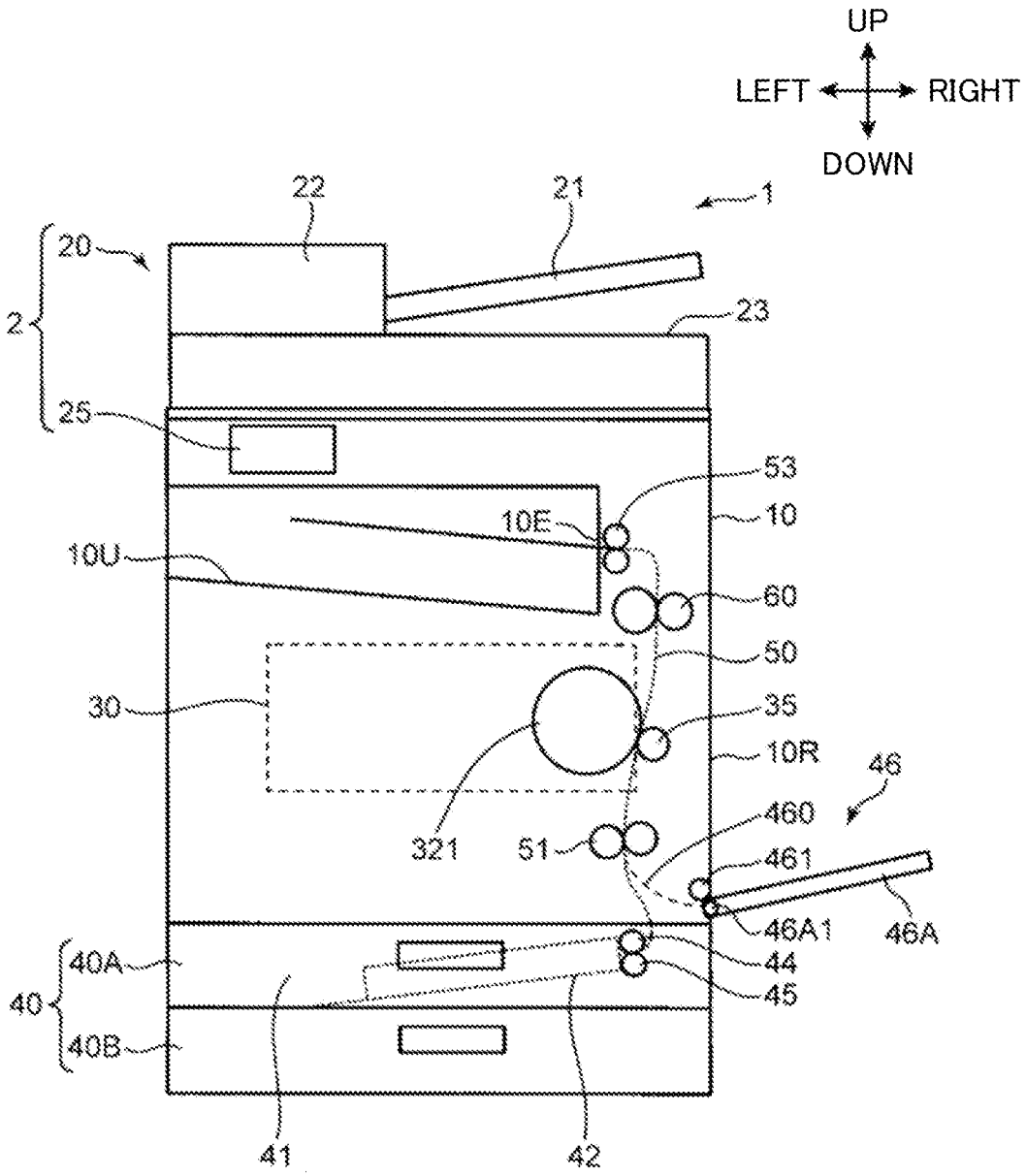


FIG. 1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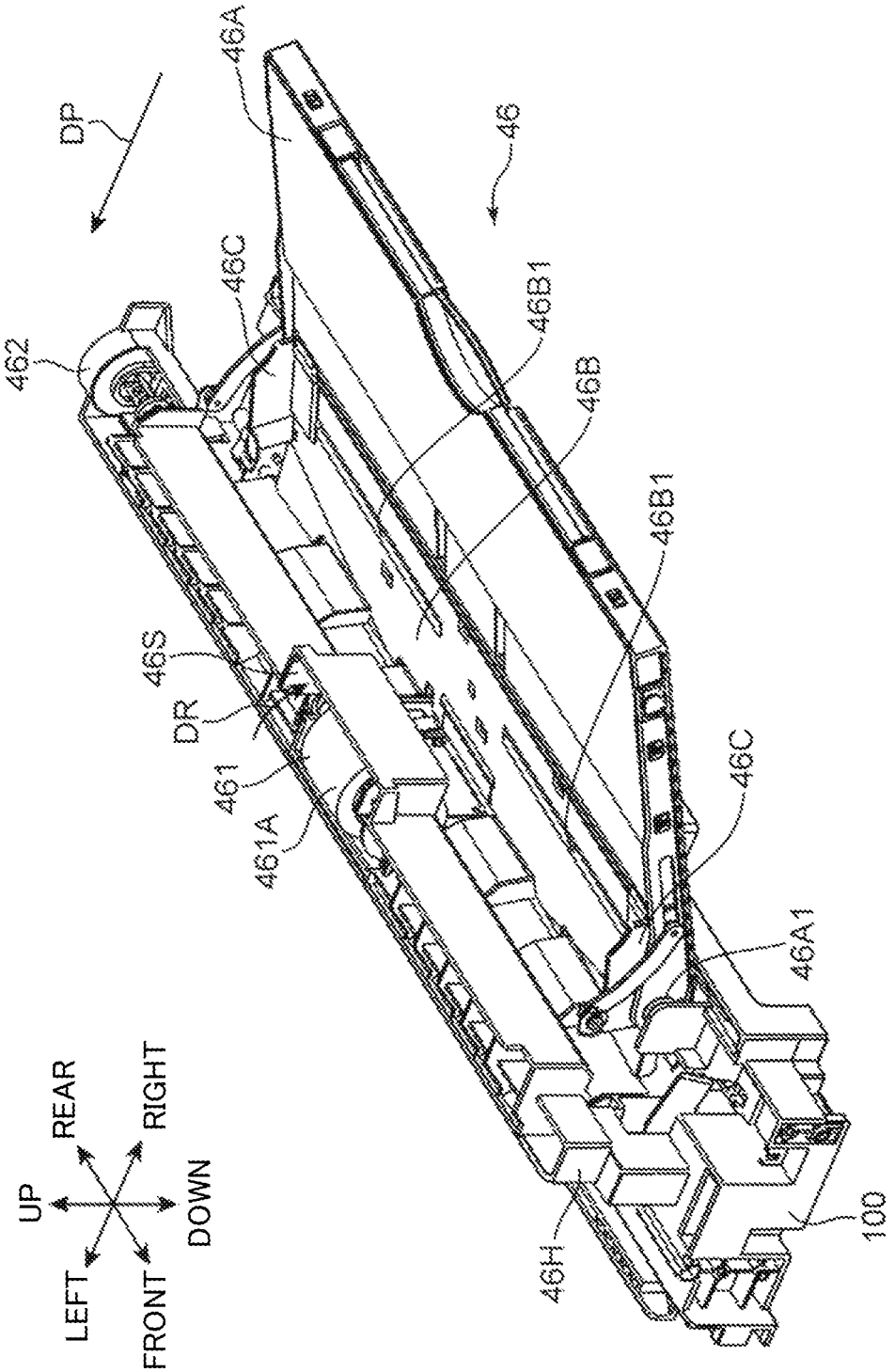
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FIG. 2

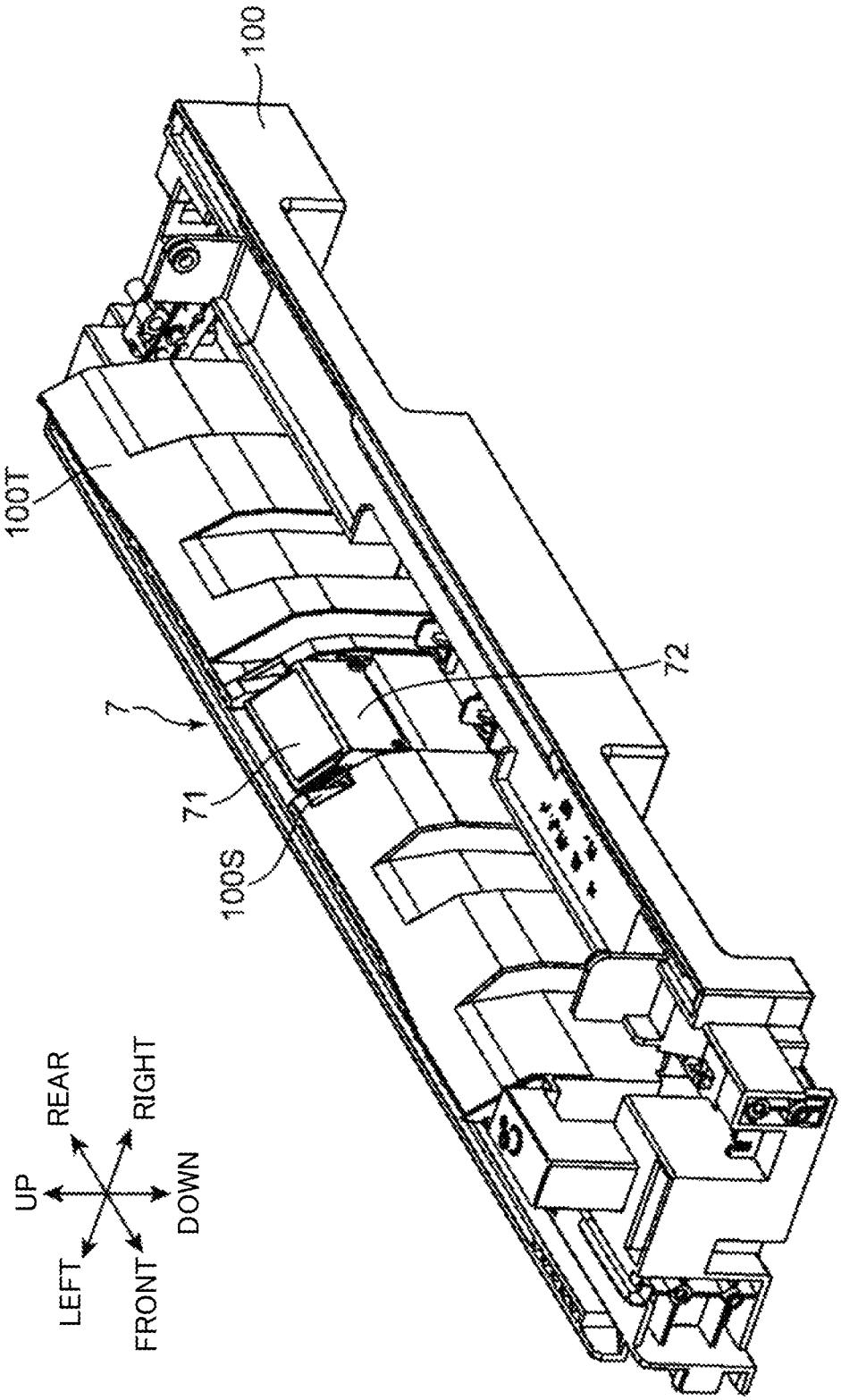
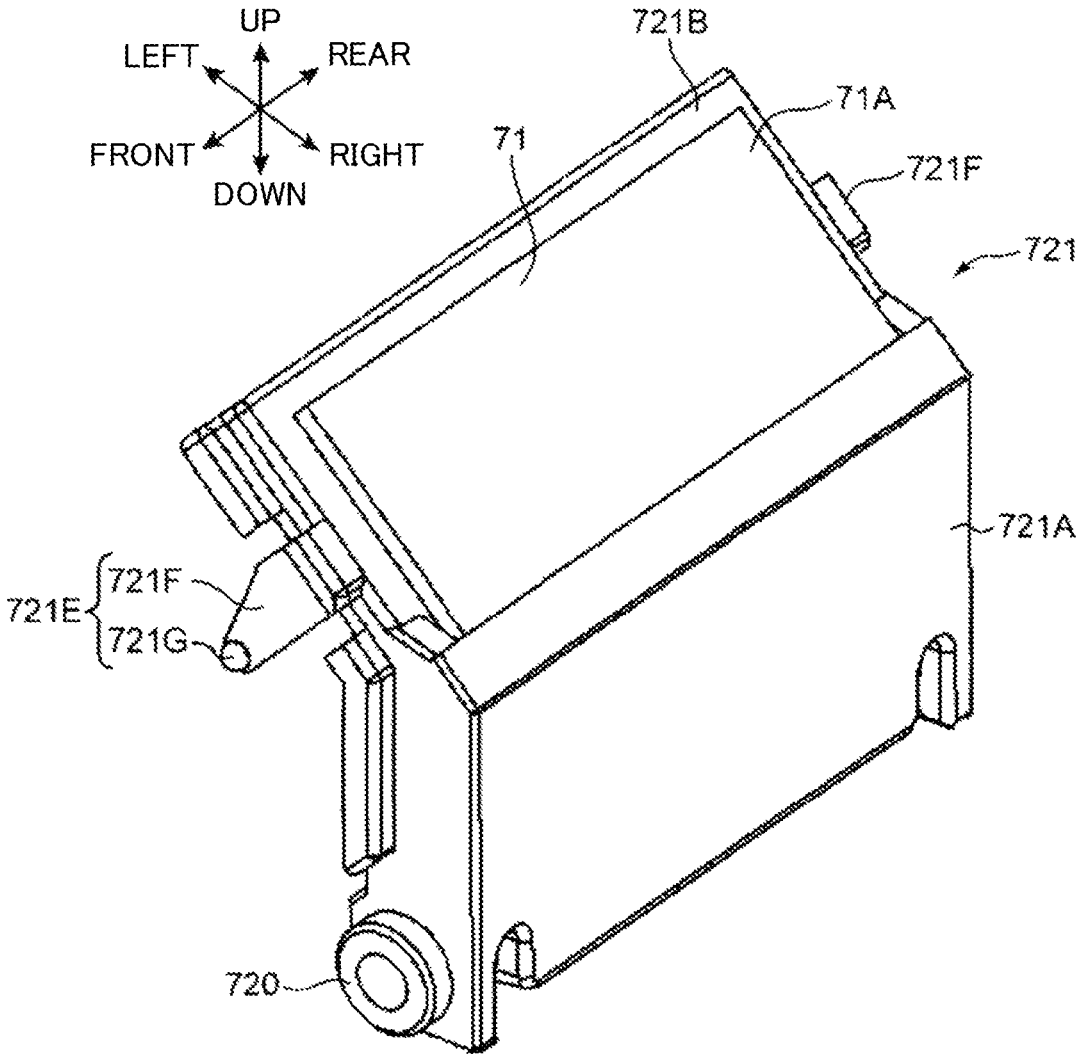


FIG. 3

FIG. 4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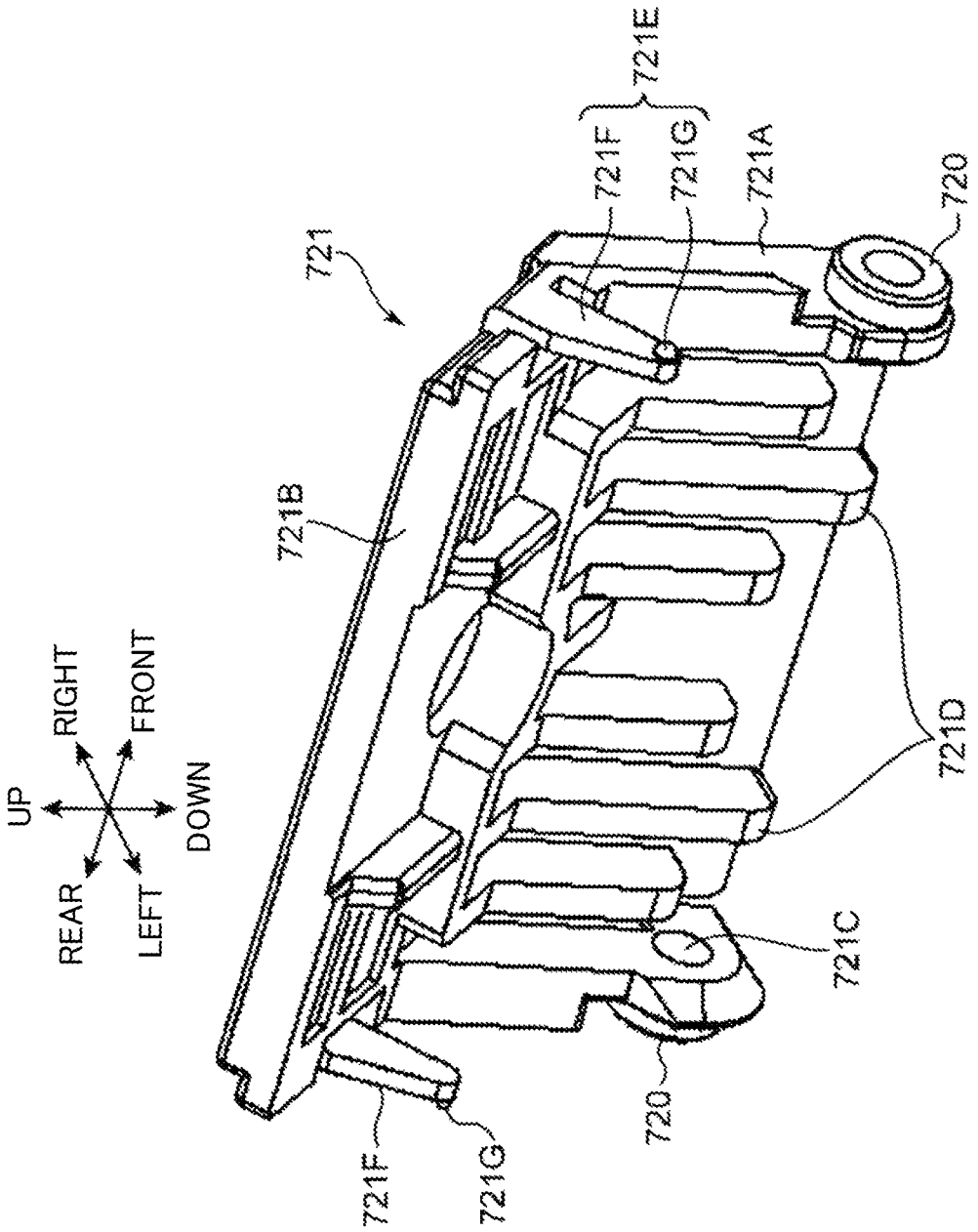
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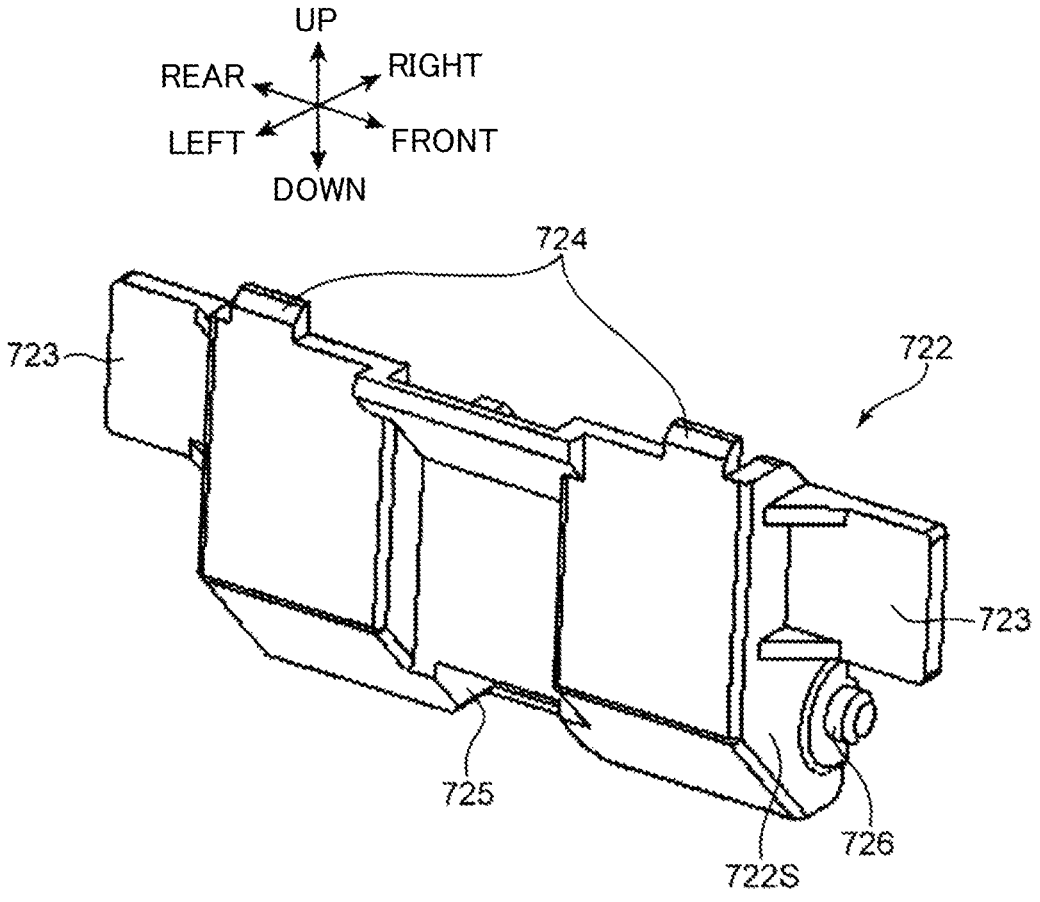
FIG. 5

FIG. 6



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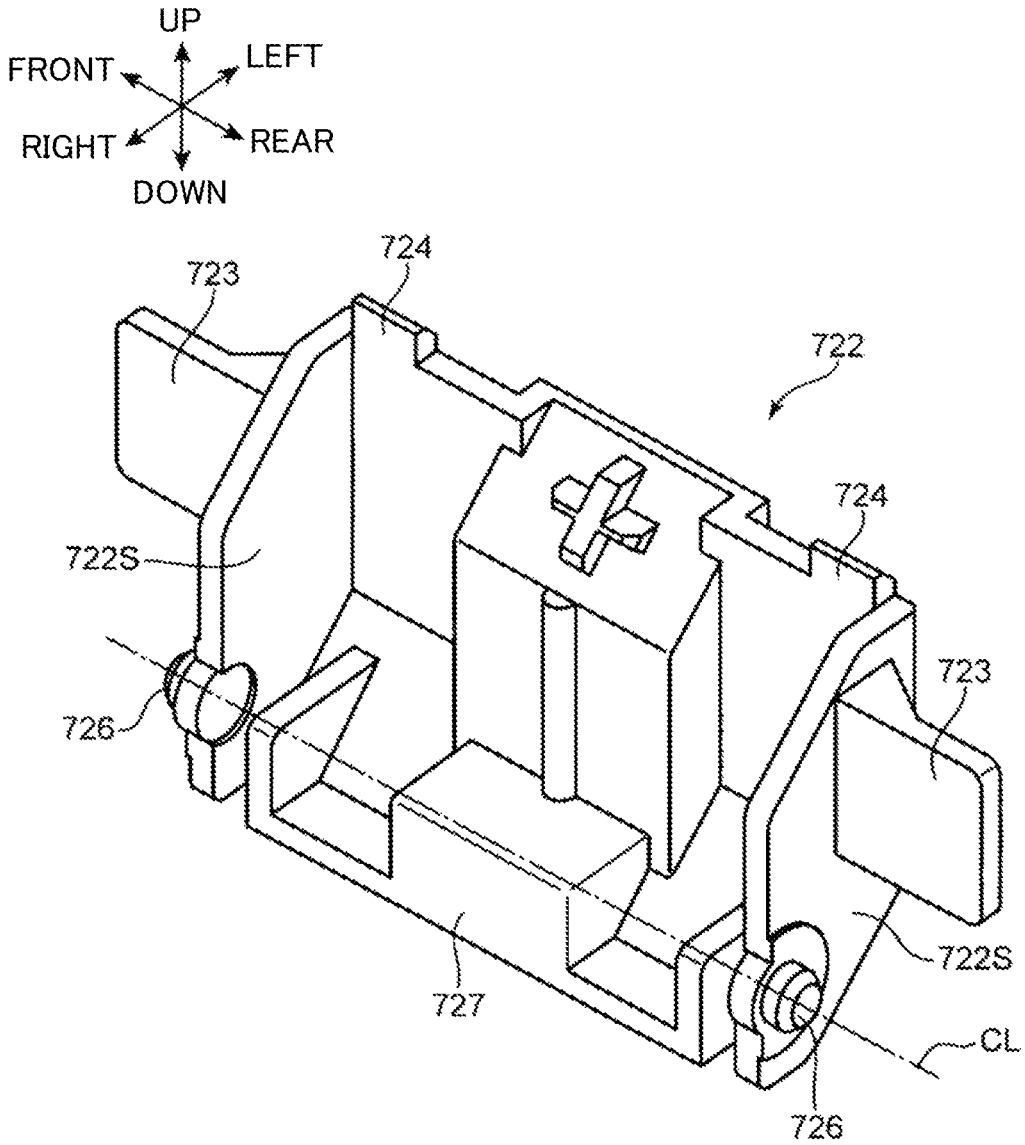
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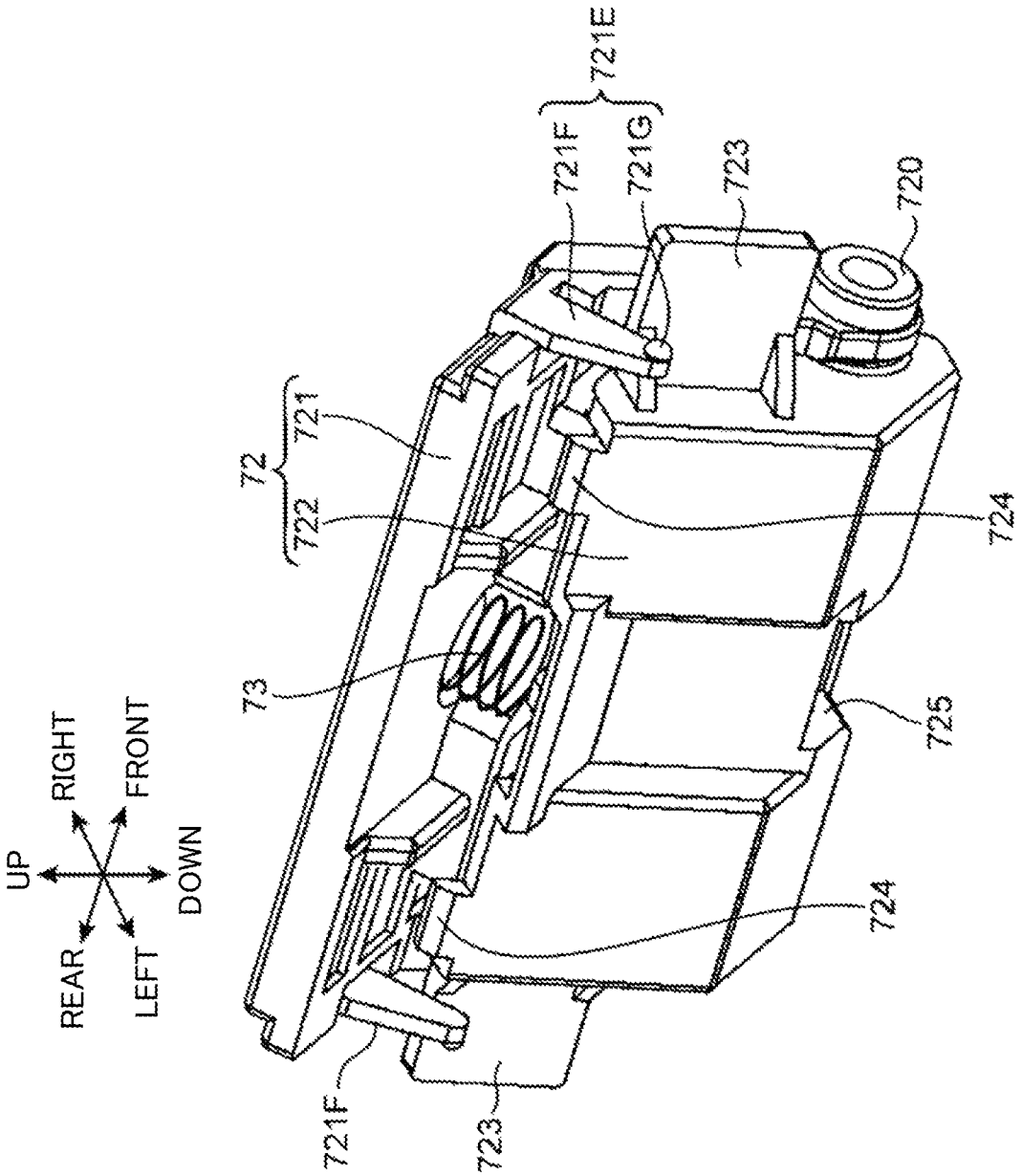
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FIG. 8

FIG. 9

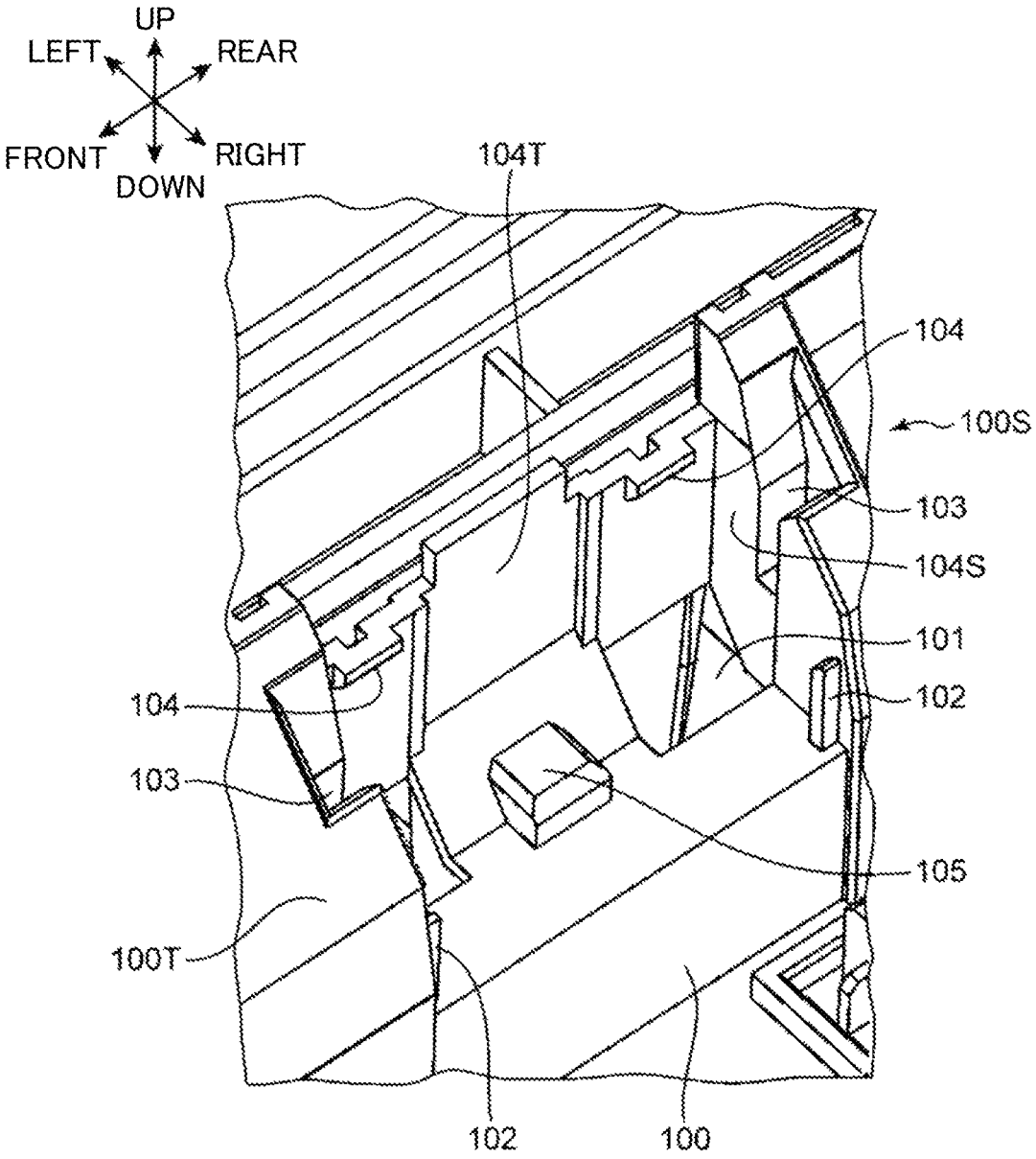
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FIG. 10

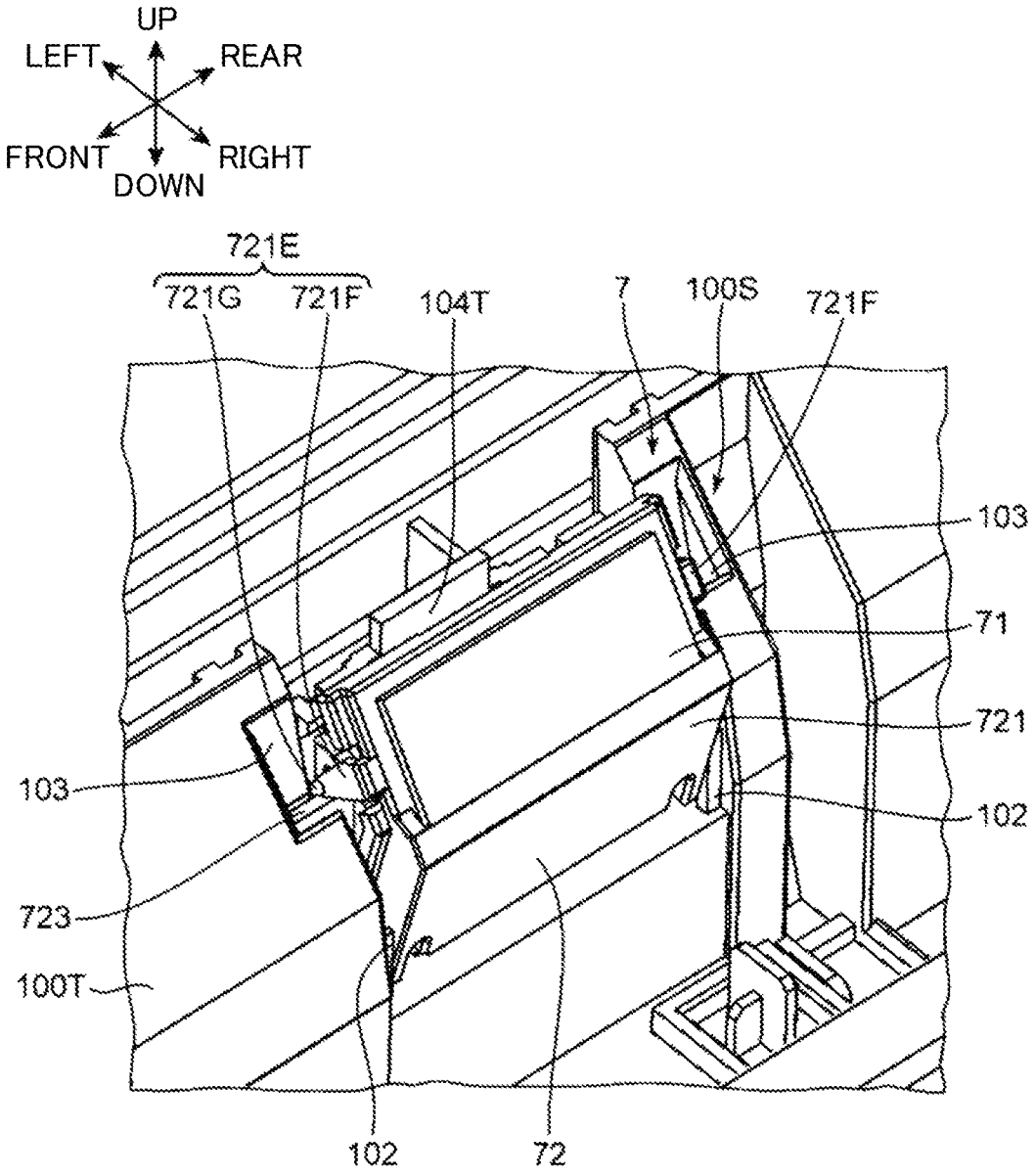
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FIG. 11

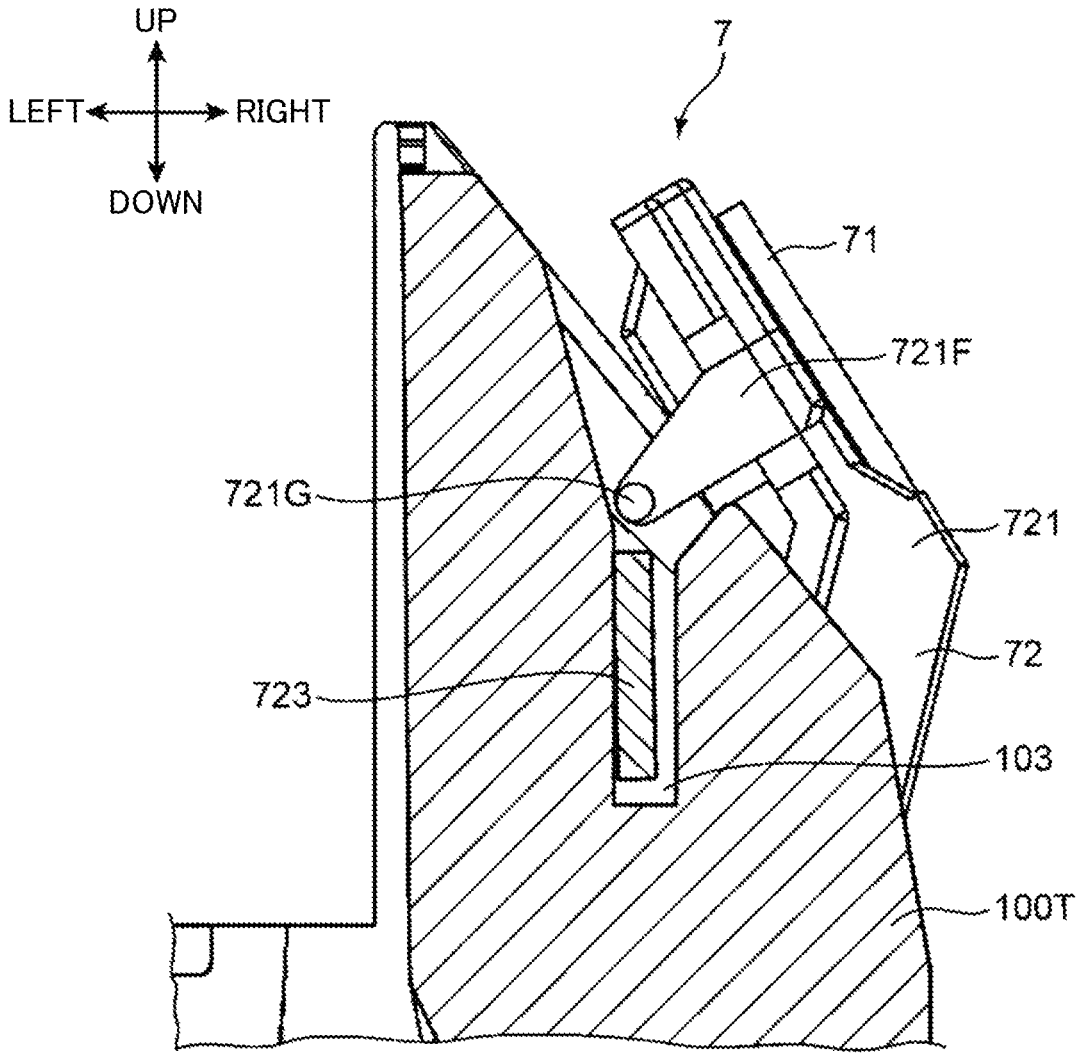

FIG. 12

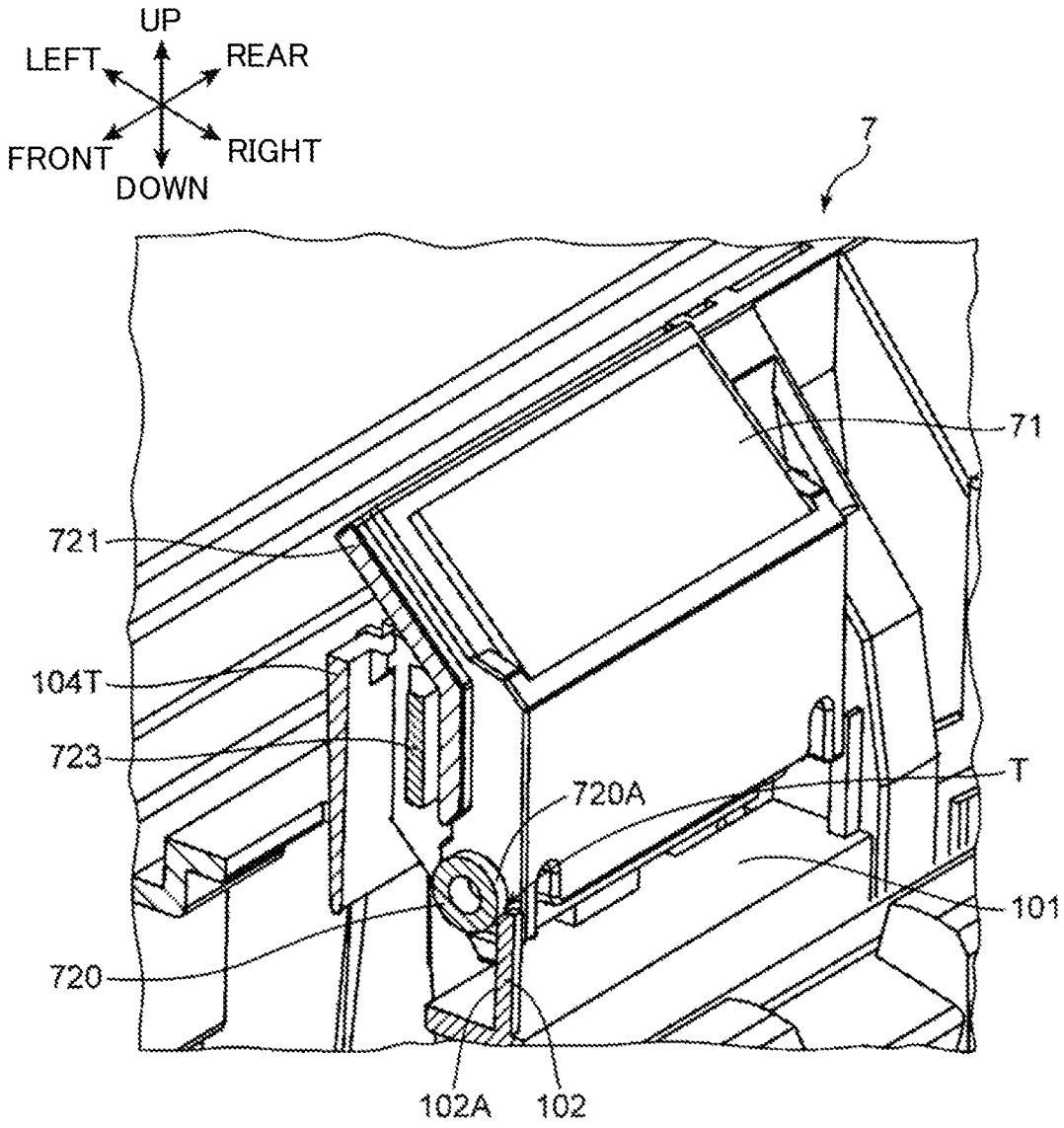
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FIG. 13

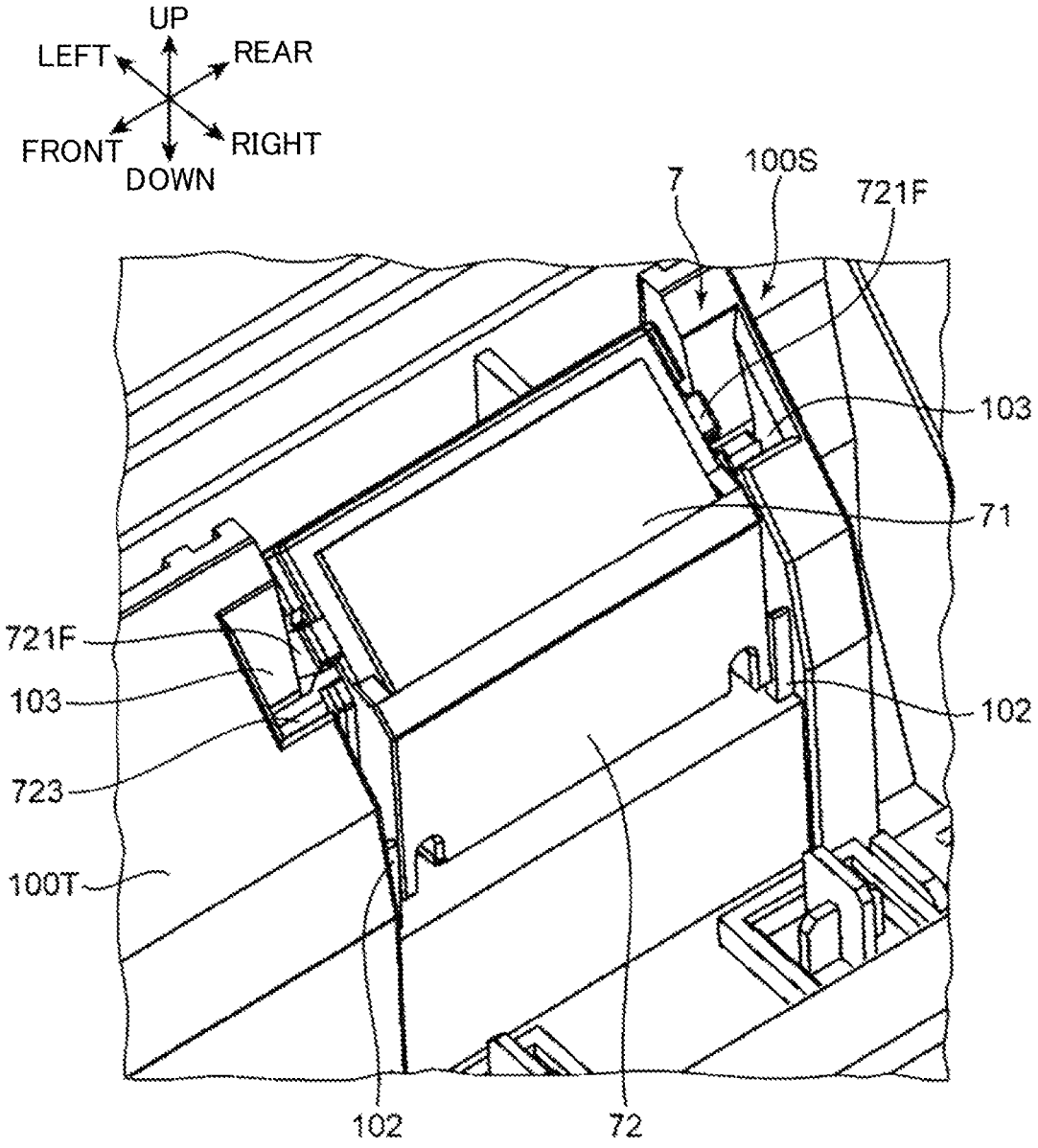
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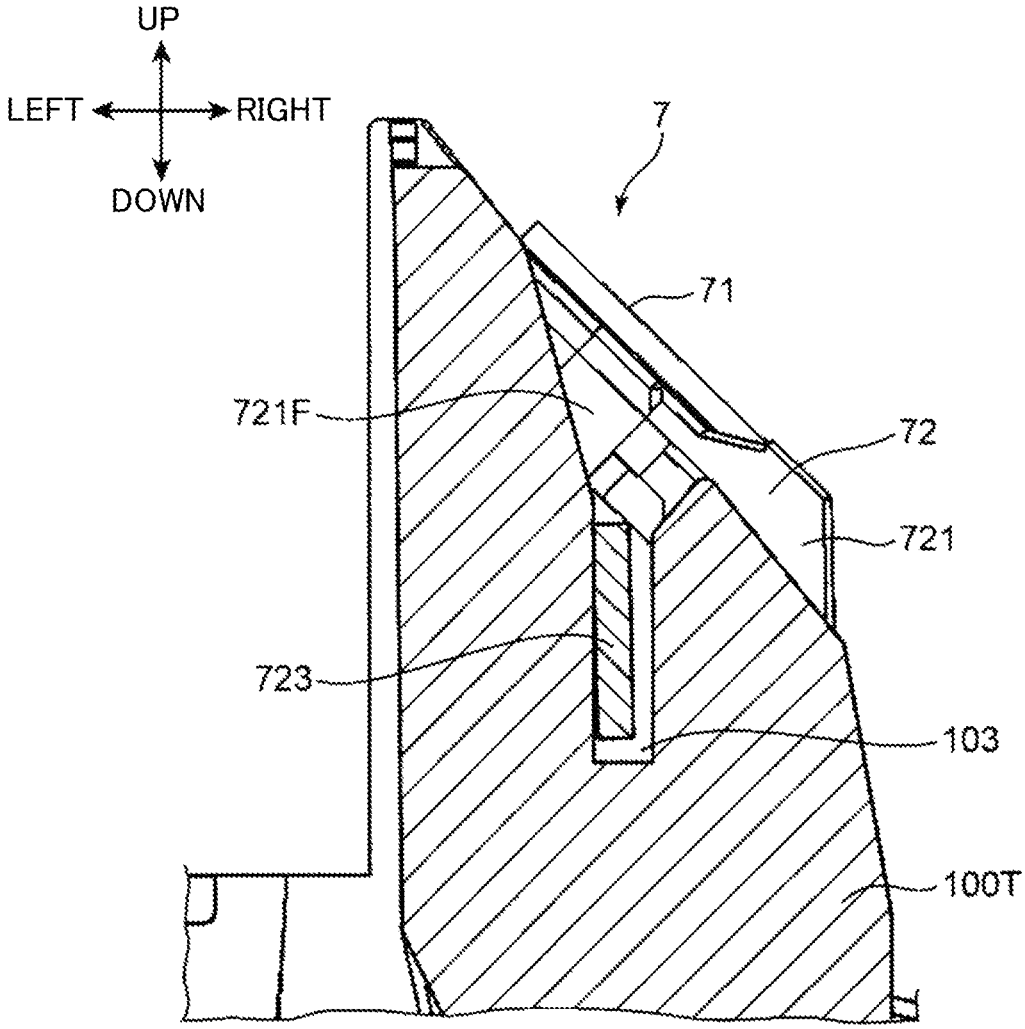
FIG. 14



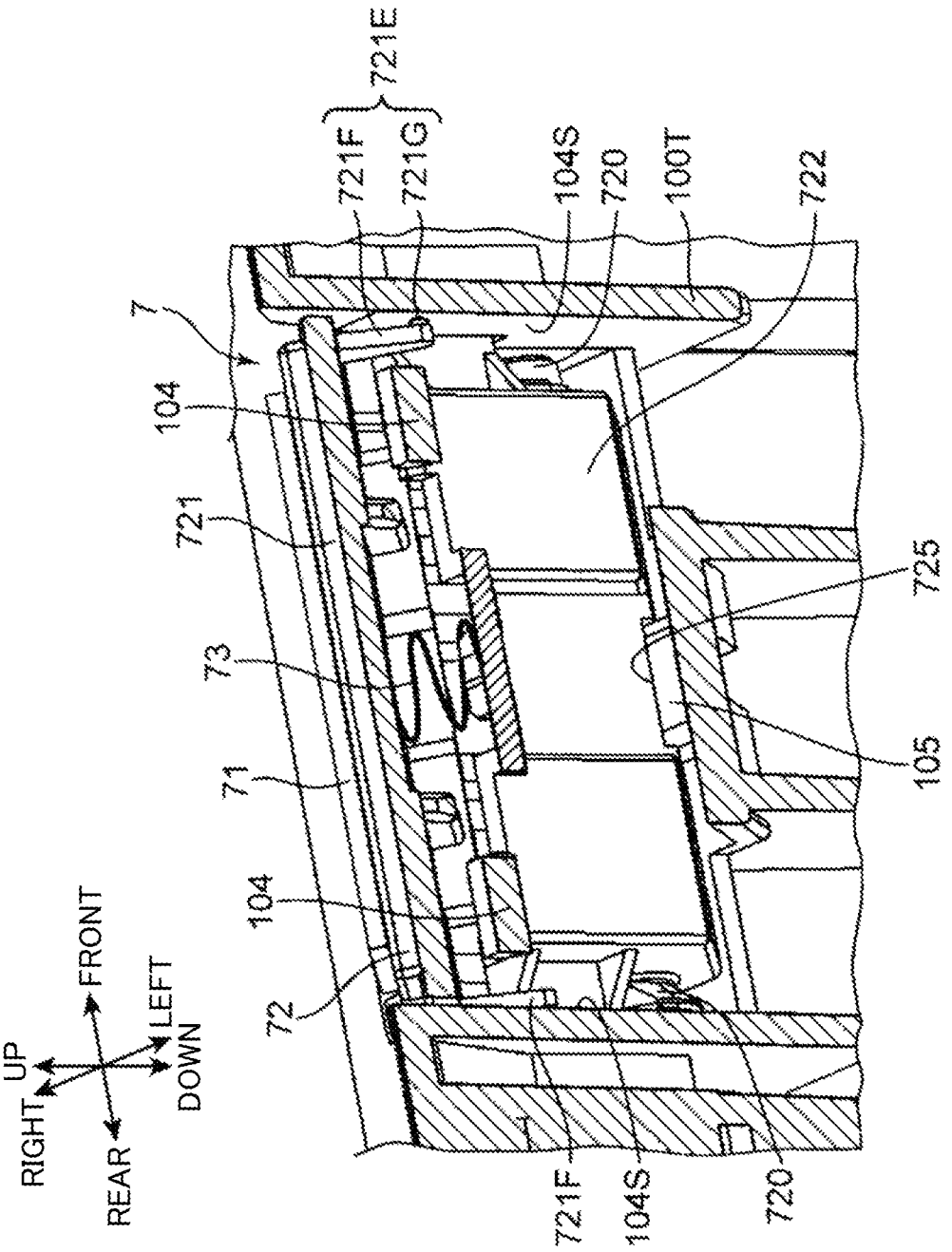

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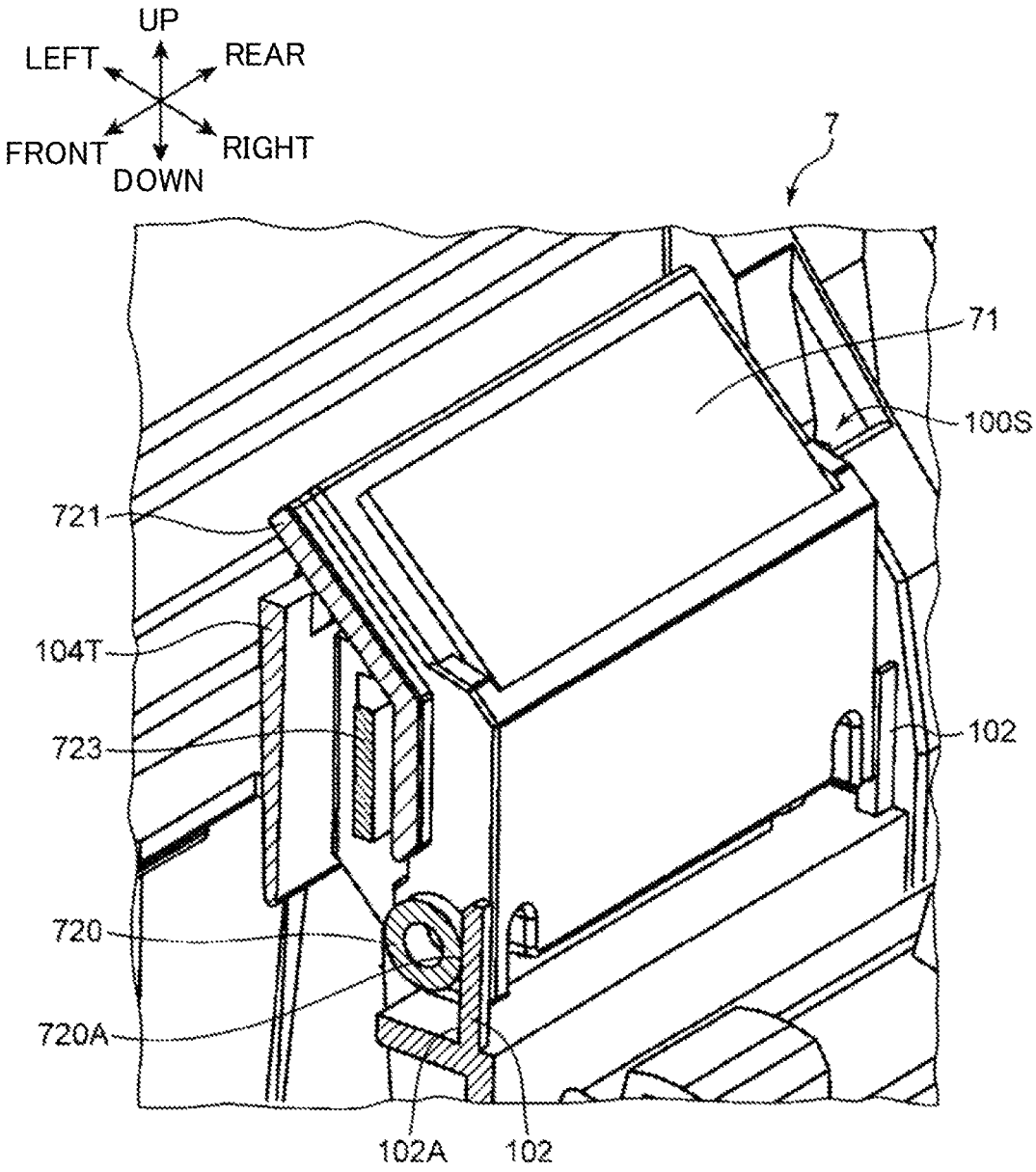
FIG. 15

FIG. 16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SHEET FEED APPARATUS, AND IMAGE FORMING APPARATUS AND IMAGE READING APPARATUS INCLUDING THE SHEET FEED APPARATUS

INCORPORATION BY REFERENCE

This application is based upon and claims the benefit of priority from the corresponding Japanese Patent Application No. 2013-135050 filed on Jun. 27, 2013, the entire contents of which are incorporated herein by reference.

BACKGROUND

The present disclosure relates to sheet feed apparatuses configured to feed sheets, and image forming apparatuses and image reading apparatuses including the sheet feed apparatuses.

To date, as a sheet feed apparatus for feeding sheets, a sheet feed apparatus mounted to an image forming apparatus has been known. The sheet feed apparatus feeds sheets contained in a sheet tray, one by one, in a sheet conveying direction. Each sheet passes through a separation nip portion formed between a sheet feed roller and a separation pad, and is conveyed downstream in the sheet conveying direction. The separation pad is urged by a spring member toward the sheet feed roller. When the sheet passes through the separation nip portion, abnormal sound is likely to occur due to vibration of the separation pad. In order to reduce occurrence of such abnormal sound, a technique has been known in which a vibration absorbing member is attached in the vicinity of a separation pad. In addition, a technique has been known in which a separation pad is supported by a support member, and is mountable/removable with respect to a sheet feed apparatus.

SUMMARY

A sheet feed apparatus according to an aspect of the present disclosure includes a casing, a sheet stacking portion, a sheet conveying path, a sheet feed roller, a separation pad, a holder, a mount portion, and an urging member. The sheet stacking portion is provided in the casing, and sheets are stacked thereon. The sheet conveying path is a conveyance path through which the sheets stacked in the sheet stacking portion are conveyed in a predetermined sheet conveying direction. The sheet feed roller is provided in the casing so as to face a downstream side of the sheet stacking portion in the sheet conveying direction, and conveys the sheets in the sheet conveying direction. The separation pad is provided facing the sheet feed roller, forms, with the sheet feed roller, a nip portion through which the sheets pass, and conveys the sheets one by one in the sheet conveying direction. The holder fixes and supports the separation pad. The mount portion is provided in the downstream side from the sheet stacking portion in the sheet conveying direction in the casing, and is configured such that the holder is mountable to and removable from the mount portion. The urging member urges the separation pad toward the sheet feed roller via the holder being in a mounted state where the holder is mounted to the mount portion. The holder is configured to be changeable in its posture between a first posture and a second posture. In the first posture, the separation pad is spaced apart from the sheet feed roller so as to release the nip portion while the holder is in the mounted state. In the second posture, the nip portion is formed between the separation pad and the sheet feed roller while the holder is in the mounted state. The holder includes a contact part that contacts the mount portion when the holder is in the second posture.

An image forming apparatus according to another aspect of the present disclosure includes the sheet feed apparatus and an image forming portion. The image forming portion is provided in the casing, and forms an image on the sheet conveyed by the sheet feed apparatus.

An image reading apparatus according to still another aspect of the present disclosure includes the sheet feed apparatus configured to convey the sheet as a document sheet, and a reading portion. The reading portion is provided facing the sheet conveying path, and reads an image on the document sheet.

This Summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description with reference where appropriate to the accompanying drawings. This Summary is not intended to identify key features or essential features of the claimed subject matter, nor is it intended to be used to limit the scope of the claimed subject matter. Furthermore, the claimed subject matter is not limited to implementations that solve any or all disadvantages noted in any part of this disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a schematic cross-sectional view showing a configuration of an image forming apparatus according to an embodiment of the present disclosure.

FIG. **2** is a perspective view of a manual sheet feed portion according to the embodiment of the present disclosure.

FIG. **3** is an internal perspective view of the manual sheet feed portion according to the embodiment of the present disclosure.

FIG. **4** is a perspective view of a first supporting plate of a holder according to the embodiment of the present disclosure.

FIG. **5** is a perspective view of the first supporting plate of the holder according to the embodiment of the present disclosure.

FIG. **6** is a perspective view of a second supporting plate of the holder according to the embodiment of the present disclosure.

FIG. **7** is a perspective view of the second supporting plate of the holder according to the embodiment of the present disclosure.

FIG. **8** is a perspective view of the holder according to the embodiment of the present disclosure.

FIG. **9** is a perspective view of a mount portion according to the embodiment of the present disclosure.

FIG. **10** is a perspective view showing a state where the holder, in its first posture, is mounted to the mount portion, according to the embodiment of the present disclosure.

FIG. **11** is a cross-sectional view showing a state where the holder, in the first posture, is mounted to the mount portion, according to the embodiment of the present disclosure.

FIG. **12** is a cross-sectional perspective view showing how the holder is mounted to the mount portion, according to the embodiment of the present disclosure.

FIG. **13** is a perspective view showing a state where the holder is in its second posture in the mount portion, according to the embodiment of the present disclosure.

FIG. **14** is a cross-sectional view showing a state where the holder is in the second posture in the mount portion, according to the embodiment of the present disclosure.

FIG. **15** is a cross-sectional perspective view showing a state where the holder is in the second posture in the mount portion, according to the embodiment of the present disclosure.

FIG. **16** is a cross-sectional perspective view showing a state where the holder is in the second posture in the mount portion, according to the embodiment of the present disclosure.

DETAILED DESCRIPTION

Hereinafter, embodiments of the present disclosure will be described in detail based on the drawings. FIG. **1** is a schematic cross-sectional view showing an internal configuration of an image forming apparatus **1** according to an embodiment of the present disclosure. In FIG. **1**, a multifunction peripheral having a printing function and a copying function is illustrated as the image forming apparatus **1**. However, the image forming apparatus may be a printer, a copy machine, a facsimile apparatus, or the like.

<Description of Image Forming Apparatus>

The image forming apparatus **1** includes an apparatus body (casing) **10**, and an ADF (automatic document feeder) **20**. The apparatus body **10** has a casing structure having a substantially rectangular parallelepiped shape. The ADF **20** is disposed above the apparatus body **10**. Inside the apparatus body **10**, a reading unit **25** (reading portion), an image forming portion **30**, a fixing portion **60**, a sheet feed portion **40**, and a conveying path **50** are provided. The reading unit **25** optically reads a document image to be copied. The image forming portion **30** forms a toner image on a sheet. The fixing portion **60** fixes the toner image on the sheet. The sheet feed portion **40** stores standard-size sheets to be conveyed to the image forming portion **30**. The conveying path **50** is a conveying route in which the standard-sized sheets are conveyed from the sheet feed portion **40** or a manual sheet feed portion **46** to a sheet discharge outlet **10**E via the image forming portion **30** and the fixing portion **60**.

The ADF **20** is rotatably attached to a top surface of the apparatus body **10**. The ADF **20** automatically feeds a document sheet to be copied toward a predetermined document reading position in the apparatus body **10**. On the other hand, when a user manually places a document sheet on the predetermined document reading position, the ADF **20** is opened upward. The ADF **20** includes a document tray **21**, a document conveying portion **22**, and a document discharge tray **23**. A document sheet is placed on the document tray **21**. The document conveying portion **22** conveys the document sheet via the document reading position. To the document discharge tray **23**, the document sheet having been read is discharged.

On the top surface of the apparatus body **10**, a contact glass (not shown) for reading of the document sheet automatically fed by the ADF **20** or a contact glass (not shown) for reading of the document sheet manually placed is disposed. The reading unit **25** optically reads an image on the document sheet through the contact glasses. The ADF **20** and the reading unit **25** form an image reading apparatus **2** described below.

The image forming portion **30** generates a toner image and forms the toner image on a sheet according to a publicly known electrophotographic method. In another embodiment, another image forming method such as an inkjet method may be employed. The image forming portion **30** includes a photosensitive drum **321**, and a charging device, an exposure device, a developing device, a cleaning device, and the like, which are not shown, arranged around the photosensitive drum **321**.

The photosensitive drum **321** rotates around its axis, and has a circumferential surface on which an electrostatic latent image and a toner image are formed. As the photosensitive drum **321**, a photosensitive drum formed of an amorphous-silicon-(a-Si)-based material may be used. The charging device uniformly charges the surface of the photosensitive drum **321**. The exposure device includes a laser light source and optical devices such as a mirror and a lens. The exposure device irradiates the circumferential surface of the photosensitive drum **321** with light based on image data of a document image to form an electrostatic latent image. The developing device supplies toner to the circumferential surface of the photosensitive drum **321** to develop the electrostatic latent image formed on the photosensitive drum **321**. The developing device uses a two-component developer, and includes a screw feeder, a magnetic roller, and a developing roller. The cleaning device includes a cleaning roller and the like, and cleans the circumferential surface of the photosensitive drum **321** from which the toner image has been transferred. A transfer roller **35** is disposed facing the photosensitive drum **321**. At a transfer nip portion between the photosensitive drum **321** and the transfer roller **35**, the toner image on the photosensitive drum **321** is transferred onto a sheet. A secondary transfer bias voltage having a polarity opposite to that of the toner image is applied to the transfer roller **35**.

The sheet feed portion **40** includes two-stage sheet feed cassettes, that is, a first sheet feed cassette **40**A and a second sheet feed cassette **40**B, which store therein standard-size sheets P among sheets to be subjected to image forming processing. These sheet feed cassettes can be drawn toward the near side of the paper face of FIG. **1** from the front of the apparatus body **10**.

The first sheet feed cassette **40**A includes a sheet storage portion **41** and a lifting plate **42**. The sheet storage portion **41** stores a sheet stack of standard-size sheets P. The lifting plate **42** lifts up the sheet stack for sheet feeding. At an upper portion on the right end side of the sheet feed cassette **40**A, a not-illustrated pick-up roller and a roller pair including a sheet feed roll **44** and a retard roller **45** are disposed. The uppermost sheet P of the sheet stack stored in the sheet feed cassette **40**A is fed one by one by driving of the pickup roller and the sheet feed roll **44**, and conveyed to an upstream end of the conveying path **50**. The second sheet feed cassette **40**B has the same structure as the first sheet feed cassette **40**A.

On a right side surface **10**R of the apparatus body **10**, a manual sheet feed portion **46** (sheet feed apparatus) is disposed. The manual sheet feed portion **46** conveys a sheet toward the image forming portion **30**. The manual sheet feed portion **46** includes a manual feed tray **46**A (sheet stacking portion) for manual sheet feeding, and a sheet feed roller **461**. Sheets are stacked in the manual feed tray **46**A. The manual feed tray **46**A is mounted to the apparatus body **10** so as to be openable and closable around a fulcrum portion **46**A**1** provided at a lower end of the manual feed tray **46**A. When a user performs manual sheet feeding, the user opens the manual feed tray **46**A as shown in FIG. **1**, and places a sheet thereon. The sheet placed on the manual feed tray **46**A is conveyed into a manually-fed-sheet conveying path **460** (sheet conveying path) by the sheet feed roller **461** being driven. The manually-fed-sheet conveying path **460** is a conveying path extending from the manual feed tray **46**A, through which a sheet is conveyed in a predetermined sheet conveying direction. The sheet conveyed in the sheet conveying direction passes through the manually-fed-sheet conveying path **460** and enters the conveying path **50**. The sheet feed roller **461** is driven to rotate, and conveys the sheet in the sheet conveying direction. The sheet feed roller **461** is mounted to the appa-

ratus body **10**. In the manual feed tray **46**A, the sheet feed roller **461** is disposed facing a portion on the downstream side in the sheet conveying direction.

The conveying path **50** is extended from the sheet feed portion **40** to the sheet discharge outlet **10**E via the image forming portion **30** and the fixing portion **60**. A registration roller pair **51** is disposed upstream of the conveying path **50** relative to the transfer nip portion. The sheet is temporarily stopped at the registration roller pair **51** that is at a stop, where skew correction is performed. Thereafter, the registration roller pair **51** is driven to rotate by a driving motor (not shown) at a predetermined time for image transfer, thereby feeding the sheet to the transfer nip portion. In addition, a plurality of sheet conveying rollers (not shown) for conveying sheets are disposed in the conveying path **50**.

A sheet discharge roller **53** is disposed at the end, on the most downstream side, of the conveying path **50**. The sheet discharge roller **53** discharges a sheet P through the sheet discharge outlet **10**E. The sheet P is discharged through the sheet discharge outlet **10**E to a sheet discharge portion **10**U and stacked therein.

The fixing portion **60** performs fixing processing to fix a toner image on the sheet. A pressure roller is pressed against a not-illustrated fixing roller to form a fixing nip portion. When the sheet passes through the fixing nip portion, the toner image transferred to the sheet is fixed on the sheet.

<Manual Sheet Feed Portion>

Next, with reference to FIGS. **2** to **9**, the manual sheet feed portion **46** according to the present embodiment will be described in detail. FIG. **2** is a perspective view of the manual sheet feed portion **46** according to the present embodiment. FIG. **3** is a perspective view of the inside (main unit **100**) of the manual sheet feed portion **46** from which a later-described housing **46**H is removed. FIG. **4** is a perspective view of a first holder portion **721** of a later-described pad holder **72**, seen from the right side. FIG. **5** is a perspective view of the first holder portion **721** seen from the left side. FIG. **6** is a perspective view of a later-described second holder portion **722** seen from the left side. FIG. **7** is a perspective view of the second holder portion **722** seen from the right side. FIG. **8** is a perspective view of the pad holder **72** including the first holder portion **721** and the second holder portion **722** being combined, seen from the left side. FIG. **9** is an enlarged perspective view of a mount portion **100**S to which the pad holder **72** is to be mounted.

With reference to FIG. **2**, the manual sheet feed portion **46** includes the main unit **100**, the manual feed tray **46**A, a manual feed lifting plate **46**B, width regulation guides **46**C, the sheet feed roller **461**, and a housing **46**H.

The main unit **100** is a casing disposed on the right side surface **10**R (FIG. **1**) of the apparatus body **10**. The main unit **100** forms a part of the apparatus body **10**. As shown in FIG. **3**, the main unit **100** is disposed so as to extend in the front-rear direction with a predetermined width in the left-right direction. A guide surface **100**T (FIG. **3**) is disposed in a center portion of the main unit **100**. The guide surface **100**T is a wall surface that defines a lower side of the manually-fed-sheet conveying path **460**, in a region downstream of the manual feed tray **46**A in the sheet conveying direction. A sheet is guided leftward and upward by the guide surface **100**T.

The above-mentioned manual feed tray **46**A is a plate-shaped member that is openable and closable with respect to the main unit **100**. The manual feed tray **46**A is rotatable around the fulcrum portion **46**A1 (FIG. **2**). A sheet is conveyed from the manual feed tray **46**A in a direction of an arrow DP in FIG. **2** (sheet conveying direction, hereinafter also simply referred to as conveying direction).

The manual feed lifting plate **46**B forms a part of a top surface portion of the manual feed tray **46**A, and is disposed on the left side (downstream side in the sheet conveying direction) of the manual feed tray **46**A. A left end portion of the manual feed lifting plate **46**B is movable up and down by a non-illustrated driving mechanism. By the up-down movement of the manual feed lifting plate **46**B, leading end portions (left end portions) of sheets stacked on the manual feed tray **46**A are moved upward. As a result, the leading end portions of the sheets contact the sheet feed roller **461**.

The width regulation guides **46**C are disposed on the manual feed lifting plate **46**B. The width regulation guides **46**C are disposed on the front side and the rear side, respectively, so as to be paired, and regulate a position, in the width direction, of a sheet. The width regulation guides **46**C are movable in the front-rear direction along guide grooves **46**B1 formed in the manual feed lifting plate **46**B via not-illustrated rack and pinion gear.

The sheet feed roller **461** is disposed upstream of the manually-fed-sheet conveying path **460** so as to face the manual feed lifting plate **46**B. The sheet feed roller **461** has a circumferential surface **461**A that is rotated, and conveys a sheet in the sheet conveying direction.

The housing **46**H has a box shape extending in the front-rear direction. The housing **46**H is disposed above the guide surface **100**T and the mount portion **100**S (refer to FIG. **3**) of the main unit **100** (refer to FIG. **2**). The housing **46**H supports the sheet feed roller **461** in the center portion in the front-rear direction such that the sheet feed roller **461** is rotatable. The center portion, in the front-rear direction, of the housing **46**H has a shape partially projecting to the right. The housing **46**H has, inside the projecting portion, an insertion space **46**S (storage space) in which the sheet feed roller **461** is housed. In addition, a driving gear **462** is disposed in the rear end portion of the housing **46**H. The driving gear **462** is connected to the sheet feed roller **461** through a not-illustrated shaft. When the driving gear **462** is rotated by a not-illustrated driving motor, the sheet feed roller **461** is rotated through the shaft in the direction of an arrow DR in FIG. **2**. Further, the sheet feed roller **461** is mounted in or removed from the insertion space **46**S via an upper portion of the insertion space **46**S. When the sheet feed roller **461** is removed from the housing **46**H, a later-described pad holder **72** can be mounted to or removed from the mount portion **100**S via the insertion space **46**S of the housing **46**H.

With reference to FIG. **3**, the manual sheet feed portion **46** further includes a separation pad portion **7**. The separation pad portion **7** has a function of handling sheets. In FIG. **2**, when the housing **46**H is removed from the main unit **100**, the separation pad portion **7** is exposed as shown in FIG. **3**. The separation pad portion **7** includes a separation pad **71** and a pad holder **72**.

The separation pad **71** is disposed facing the circumferential surface **461**A of the sheet feed roller **461**. The separation pad **71** includes a separation surface **71**A (refer to FIG. **4**) that forms, with the circumferential surface **461**A, a nip portion through which a sheet passes. The separation pad **71** is formed of a plate-shaped elastic member. For example, the separation pad **71** is formed as a rubber member. The separation surface **71**A of the separation pad **71** has a high coefficient of friction with respect to a sheet. Due to a frictional force between a sheet and the separation surface **71**A, sheets, other than an uppermost sheet, in a stack of sheets are prevented from being conveyed downstream in the sheet conveying direction. In

other words, the separation pad **71** allows the sheet feed roller **461** to convey the sheets one by one in the sheet conveying direction.

The pad holder **72** fixes and supports the separation pad **71**. In addition, the pad holder **72** is mounted to the mount portion **100**S formed in the center portion, in the front-rear direction, of the main unit **100**. The mount portion **100**S is provided on the guide surface **100**T that is positioned in the downstream side from the manual feed tray **46**A in the sheet conveying direction (refer to FIG. **3**). The mount portion **100**S has a mount space **101** in which the pad holder **72** is to be mounted (refer to FIG. **9**). The pad holder **72** is mounted to or removed from the mount portion **100**S by a user of the image forming apparatus **1** or a maintenance worker.

With reference to FIGS. **4** to **8**, the pad holder **72** includes a first holder portion **721** (first supporting plate) and a second holder portion **722** (second supporting plate). The posture of the pad holder **72** is changeable between a first posture and the second posture. The first posture is a posture that the pad holder **72** takes until it is mounted in the mount space **101** of the mount portion **100**S. In addition, the first posture is a posture in which the separation pad **71** of the pad holder **72** is spaced apart from the sheet feed roller **461** so as to release the nip portion, with the pad holder **72** being mounted to the mount portion **100**S. Specifically, the first posture is a posture in which the separation pad is disposed on the sheet feed roller **461** side when the sheet feed roller **461** is spaced apart from the separation pad **71** of the pad holder **72**, with the pad holder **72** being mounted to the mount portion **100**S. That is, in the first posture, the sheet feed roller **461** is spaced apart from the separation pad **71**. The second posture is a posture in which the nip portion is formed between the separation pad **71** and the sheet feed roller **461** with the pad holder **72** in the first posture being mounted in the mount space **101**. In addition, the pad holder **72** slides along main body guide pieces **102** when being mounted to the mount space **101** as described later, and is pressed against the main body guide pieces **102** in the mount space **101** when the nip portion of between the separation pad **71** and the sheet feed roller **461** is formed. Then, the pad holder **72**, in the first posture, is in a state where a predetermined gap T (refer to FIG. **12**) is formed between the pad holder **72** and each of the main body guide pieces **102** of the mount portion **100**S as described later. In addition, the pad holder **72**, in the second posture, is in a state where it is pressed against the main body guide pieces **102** in the mount space **101** of the mount portion **100**S (refer to FIG. **16**).

The first holder portion **721** supports the separation pad **71**. The first holder portion **721** is disposed as a right side portion of the pad holder **72**. The first holder portion **721** is formed as a plate-shaped member that is bent with a center portion thereof in the up-down direction being a ridge line. The first holder portion **721** includes a first support portion **721**A and a second support portion **721**B. The first support portion **721**A corresponds to a lower portion of the first holder portion **721**. The second support portion **721**B corresponds to an upper portion of the first holder portion **721**. In the second posture of the pad holder **72** corresponding to the sheet feeding operation, the first support portion **721**A is disposed so as to extend in substantially vertical direction. In addition, the second support portion **721**B is bent at a predetermined angle with respect to the first support portion **721**A, and has a surface inclined to the downstream side in the sheet conveying direction, toward an upper portion thereof. As shown in FIG. **4**, the second support portion **721**B fixes and supports the separation pad **71**. The first support portion **721**A includes a pair of cylindrical parts **720**, a pair of holes **721**C, a pair of parts-to-be-engaged **721**D, and a pair of contact parts **721**E (refer to FIG. **4** and FIG. **5**).

Each cylindrical part **720** is disposed so as to project from a lower end portion of the first support portion **721**A, in other words, from a portion of the first holder portion **721** lower than the separation pad **71** in the pad holder **72**. The pair of cylindrical parts **720** are disposed so as to project in the sheet width direction (front-rear direction) intersecting the sheet conveying direction. Each cylindrical part **720** has an outer circumferential surface **720**A (refer to FIG. **12**). The pair of holes **721**C are opened inside, in the sheet width direction (front-rear direction), with respect to the pair of cylindrical parts **720**, respectively. The holes **721**C are opened facing the sheet width direction at the lower end side of the first support portion **721**A. The holes **721**C are communicated with the interiors of the cylindrical parts **720**. Although in FIG. **5** only one of the holes **721**C is shown, the other hole **721**C is provided at the front side as well. The parts-to-be-engaged **721**D are lower portions of a pair of ribs disposed at the rear side of the first support portion **721**A, and face a later-described engaging part **727** of the second holder portion **722**.

The contact parts **721**E are disposed on both end portions, in the sheet width direction, of the second support portion **721**B of the first holder portion **721**. The contact parts **721**E are spaced apart from the later-described mount portion **100**S in the first posture of the pad holder **72**, and contact the mount portion **100**S in the second posture of the pad holder **72**. Each contact part **721**E includes an extending portion **721**F and a hemisphere portion **721**G (projecting portion). The extending portion **721**F is disposed so as to project from an end portion of the first holder portion **721** in the sheet width direction, toward the second holder portion **722**. The extending portion **721**F is elastically deformable, and a front end thereof is movable in the sheet width direction. The hemisphere portion **721**G is disposed so as to project outward in the sheet width direction from the front end of the extending portion **721**F. The hemisphere portion **721**G has a hemispherical shape that tapers outward in the sheet width direction. The hemisphere portion **721**G has a function of coming into contact with later-described inner wall parts **104**S. As shown in FIG. **8**, the contact part **721**E is located above guide pieces **723** of the later-described second holder portion **722**.

The second holder portion **722** (refer to FIGS. **6** and **7**) is disposed to the left of the first holder portion **721** so as to face the first holder portion **721** (refer to FIG. **8**). In other words, the second holder portion **722** is disposed on the side opposite to the sheet feed roller **461**(FIG. **2**) with respect to the first holder portion **721** so as to face the first holder portion **721**. The second holder portion **722** is a plate-shaped member extending in the front-rear direction, and includes a pair of side walls **722**S in the front-rear direction.

The second holder portion **722** includes the guide pieces **723** (guide plates), contact pieces **724**, a cut portion **725**, shafts **726**, and an engaging part **727**. The guide pieces **723** are a pair of plate-shaped members disposed so as to project in the sheet width direction (front-rear direction) from both end portions, in the sheet width direction, of the second holder portion **722**. The guide pieces **723** are disposed so as to extent in the up-down direction. The contact pieces **724** are a pair of projecting pieces disposed so as to project upward from an upper edge of the second holder portion **722**. The cut portion **725** is formed by denting upward a center portion of the second holder portion **722** at a lower edge thereof. The cut portion **725** is a dent having a substantially rectangular parallelepiped shape corresponding to a later-described lower support part **105** of the mount portion **100**S. Beneath the pair

of guide pieces **723**, the shafts **726** are extended outward in the sheet width direction (front-rear direction) from the side walls **722**S of the second holder portion **722**, and can be inserted to the above-mentioned holes **721**C. Each shaft **726** is a substantially cylindrical projection. In addition, the engaging part **727** is the rear side of the cut portion **725**, and corresponds to a lower end portion of the second holder portion **722**.

The pair of shafts **726** of the second holder portion **722** are inserted in the pair of holes **721**C (refer to FIG. **5**) of the first holder portion **721**, and thereby the first holder portion **721** and the second holder portion **722** are connected to each other. At this time, a rotation axis line CL (refer to FIG. **7**) is formed between the pair of shafts **726**. In other words, the rotation axis line CL is extended in the sheet width direction at the lower end of the second holder portion **722**. Then, the first holder portion **721** is rotatable with respect to the second holder portion **722** around the rotation axis line CL. In other words, the first holder portion **721** is supported rotatably around the shafts **726** by the second holder portion **722**. The rotation axis line CL is disposed coaxially with the cylindrical axis of the pair of cylindrical parts **720**.

Further, the separation pad portion **7** includes an urging spring **73** (urging member) (refer to FIG. **8**). The urging spring **73** is a coil spring compressed and disposed between the first holder portion **721** and the second holder portion **722**. The urging spring **73** urges the first holder portion **721** upward and rightward. As a result, the separation pad **71** is pressed toward the circumferential surface **461**A of the sheet feed roller **461**, and thereby a nip portion is formed stably. The urging spring **73** may be disposed on the mount portion **100**S side. However, the urging spring **73** being disposed between the first holder portion **721** and the second holder portion **722** allows a nip pressure to be appropriately maintained even in the pad holder **72** that is mountable to and removable from the mount portion **100**S. In other words, if the urging spring is fixedly disposed on the mount portion **100**S side, the contact position between the mountable/removable pad holder **72** and the urging spring is unstable, and the nip pressure is likely to vary. In addition, when the engaging part **727** of the second holder portion **722** contacts the parts-to-be-engaged **721**D of the first holder portion **721**, an opening angle between the first holder portion **721** and the second holder portion **722** around the rotation axis line CL is restricted in a predetermined range. In other words, the parts-to-be-engaged **721**D of the first holder portion **721** and the engaging part **727** of the second holder portion **722** function as an anti-rotation member of the first holder portion **721**.

With reference to FIG. **9**, the mount portion **100**S includes the mount space **101**, the main body guide pieces **102** (guide members), guide grooves **103**, upper support parts **104**, and a lower support part **105**. In addition, the mount portion **100**S includes inner wall parts **104**S.

The mount space **101** is a space in which the pad holder **72** is to be mounted. The mount space **101** is a space opened upward and to the manual feed tray **46**A side (rightward). The main body guide pieces **102** are disposed in the mount portion **100**S, and guide the pad holder **72** to the mount space **101** of the mount portion **100**S. More specifically, on the upstream side (right side) of the mount space **101** in the sheet conveying direction, the main body guide pieces **102** are disposed, so as to be paired, at both ends of the mount space **101** in the sheet width direction. In the mount portion **100**S, the main body guide pieces **102** are disposed between the pad holder **72** and the manual feed tray **46**A. The main body guide pieces **102** are a pair of plate-shaped members extending in the up-down direction with a predetermined width in the front-rear direction. The main body guide pieces **102** have wall surfaces **102**A (refer to FIG. **12**) extending in the up-down direction and facing the pad holder **72**, on the side opposite to the manual feed tray **46**A (the downstream side in the sheet conveying direction).

The guide grooves **103** are a pair of grooves formed by partially cutting the guide surface **100**T at both ends of the mount portion **100**S in the front-rear direction. The guide grooves **103** extend in the up-down direction. The guide pieces **723** of the pad holder **72** are inserted in the guide grooves **103**. The upper support parts **104** are a pair of projecting pieces disposed so as to project from a wall part **104**T of the mount portion **100**S on the downstream side (left side) of the mount portion **100**S in the sheet conveying direction. The wall part **104**T defines the downstream side of the mount space **101** in the sheet conveying direction. The upper support parts **104** are disposed so as to project from the wall part **104**T upstream in the sheet conveying direction. In addition, the side surfaces of the upper support parts **104** on the upstream side in the sheet conveying direction each have an inclined surface facing rightward and downward. The contact pieces **724** of the pad holder **72** are engaged with the upper support parts **104**. As a result, the second holder portion **722** of the pad holder **72** is fixed to the mount portion **100**S. That is, the second holder portion **722** is mounted to the mount portion **100**S. The lower support part **105** is a projection disposed at the bottom in the mount space **101** of the mount portion **100**S so as to project upward. The lower support part **105** has a substantially rectangular parallelepiped shape. The lower support part **105** is inserted in the cut portion **725** of the pad holder **72**. With the lower support part **105** and the cut portion **725**, the position of the pad holder **72** in the front-rear direction (sheet width direction) is restricted within a predetermined amount of backlash.

The inner wall parts **104**S are a pair of inner wall parts which define the front and rear ends of the mount space **101**, and face the pad holder **72** in the sheet width direction. The above-mentioned guide grooves **103** are formed by partially cutting the inner wall parts **104**S. The inner wall parts **104**S are disposed in a standing manner so as to face in the sheet width direction. In FIG. **9**, only the rear-side inner wall part **104**S is shown.

Hereinafter, how to mount/remove the pad holder **72** to/from the mount portion **100**S will be described with reference to FIGS. **10** to **16** in addition to FIGS. **8** and **9**. FIG. **10** is a perspective view showing the pad holder **72** in the first posture being mounted in the mount space **101** of the mount portion **100**S. FIG. **11** is a cross-sectional view showing the pad holder **72** in the first posture being mounted in the mount space **101** of the mount portion **100**S. FIG. **12** is a cross-sectional perspective view showing how to mount the pad holder **72** to the mount portion **100**S, particularly, showing the relationship between the cylindrical part **720** and the main body guide pieces **102**. FIG. **13** is a perspective view showing the pad holder **72** being in the second posture in the mount portion **100**S. FIG. **14** is a cross-sectional view showing the pad holder **72** being in the second posture in the mount portion **100**S. FIG. **15** is a cross-sectional perspective view showing the pad holder **72** being in the second posture in the mount portion **100**S, seen from the left side. FIG. **16** is a cross-sectional perspective view showing the pad holder **72** being in the second posture in the mount portion **100**S, seen from the right side.

With reference to FIG. **2**, when the sheet feed roller **461** is removed upward from the insertion space **46**S of the housing **46**H, the separation pad portion **7** is exposed upward in the insertion space **46**S. Then, the pad holder **72** is mountable to

and removable from the mount portion **100**S in the up-down direction via the insertion space **46**S. Thus, in the present embodiment, the sheet feed roller **461** and the pad holder **72** are mounted/removed in the same direction by using the insertion space **46**S of the housing **46**H. Therefore, the operability in mounting/removing the sheet feed roller **461** and the pad holder **72** is improved.

With reference to FIGS. **7** and **8**, the pad holder **72** is mounted to or removed from the mount portion **100**S in a state where the distance between the first holder portion **21** and the second holder portion **722** is greatest around the rotation axis line CL due to the urging force of the urging spring **73**. The posture of the pad holder **721** at this time is defined as the first posture (refer to FIGS. **10** and **11**).

When the pad holder **72** is mounted to the mount portion **100**S from above, the guide pieces **723** projecting from the second holder portion **722** are inserted into the guide grooves **103**. In addition, the pad holder **72** is guided by the wall surfaces **102**A of the main body guide pieces **102** while sliding along the wall surfaces **102**A. Specifically, as shown in FIG. **12**, in a state where a predetermined gap T can be formed between each wall surface **102**A and the outer circumferential surface **720**A of the cylindrical part **720** of the first holder portion **721**, the pad holder **72** in the first posture is mounted to the mount portion **100**S while the outer circumferential surface **720**A is guided by the wall surface **102**A. Therefore, when the pad holder **72** is mounted to the mount portion **100**S, the outer circumferential surface **720**A and the wall surface **102**A are prevented from strongly rubbing each other. Accordingly, the pad holder **72** is smoothly inserted in the mount portion **100**S. Particularly, since the outer circumferential surface **720**A of the cylindrical part **720** is guided by the wall surface **102**A of the main body guide piece **102**, the contact area between the outer circumferential surface **720**A and the wall surface **102**A is reduced due to the circumferential shape of the outer circumferential surface **720**A, thereby further preventing the outer circumferential surface **720**A and the wall surface **102**A from strongly rubbing each other. Although in FIG. **12** the first holder portion **721** looks like parallel to the guide piece **723** of the second holder portion **722**, actually the first holder portion **721** is mounted in or removed from the mount space **101** while being inclined rightward around the rotation axis line CL as shown in FIGS. **10** and **11**. Even if the angle of the first holder portion **721** with respect to the second holder portion **722** is changed, since the cylindrical part **720** has the cylindrical shape, any area of the outer circumferential surface **720**A of the cylindrical part **720** can constantly face the wall surface **102**A of the main body guide pieces **102**. As a result, the pad holder **72** is stably guided inward and outward the mount space **101** by the main body guide pieces **102**.

When the pad holder **72** is mounted in the mount space **101** of the mount portion **100**S, the second holder portion **722** of the pad holder **72** is fixed to the wall part **104**T (refer to FIG. **9**) of the mount portion **100**S. On the other hand, in the mount space **101** of the mount portion **100**S, the first holder portion **721** is rotatable with respect to the second holder portion **722**. In this state, as shown in FIG. **10**, the hemisphere portion **721**G of the contact part **721**E projecting from the first holder portion **721** is disposed so as to face the guide groove **103**. In addition, the hemisphere portion **721**G does not contact any wall part of the mount portion **100**S before the pad holder **72** is mounted in the mount space **101**. That is, the hemisphere portion **721**G is spaced apart from the mount portion **100**S. Therefore, mounting of the pad holder **72** in the mount space **101** is not prevented by the hemisphere portion **721**G (contact part **721**E).

After the pad holder **72** is mounted in the mount space **101** as described above, the sheet feed roller **461** is mounted in the insertion space **46**S (refer to FIG. **2**) of the housing **46**H disposed above the mount portion **100**S. At this time, the sheet feed roller **461** presses the separation pad **71** downward against the urging force of the urging spring **73** (refer to FIG. **8**). Thereby, the first holder portion **721** rotates around the rotation axis line CL so as to come close to the second holder portion **722**. As a result, the posture of the pad holder **72** changes from the first posture to the second posture. That is, mounting of the sheet feed roller **461** to the housing **46**H realizes a change in the posture of the pad holder **72**.

In the second posture, the contact pieces **724** (refer to FIG. **7**) of the second holder portion **722** contact the upper support parts **104** (refer to FIG. **9**) of the mount portion **100**S, and the guide pieces **723** of the second holder portion **722** contact one surface of the guide grooves **103** of the mount portion **100**S (refer to FIG. **14**). Thereby, the second holder portion **722** is fixed to the mount portion **100**S. Then, the urging spring **73** urges the separation pad **71** toward the sheet feed roller **461** via the first holder portion **721**. Therefore, the nip portion is stably formed.

In the present embodiment, when the first holder portion **721** rotates around the rotation axis line CL, the pad holder **72** changes its posture from the first posture to the second posture (refer to FIGS. **13** and **14**) while the hemisphere portions **721**G frictionally slide on the inner wall parts **104**S (refer to FIG. **9**). Then, in the second posture of the pad holder **72**, the hemisphere portions **721**G contact the inner wall parts **104**S along the sheet width direction (refer to FIG. **15**). Specifically, of the pair of hemisphere portions **721**G, the hemisphere portion **721**G of the front-side contact part **721**E faces forward and contacts the inner wall part **104**S. On the other hand, the hemisphere portion **721**G (not shown in FIG. **15**) of the rear-side contact part **721**E faces backward and contacts the inner wall part **104**S. Thus, the pair of hemisphere portions **721**G contact the pair of inner wall parts **104**S, thereby restricting the position of the pad holder **72** in the sheet width direction.

Accordingly, during the sheet feeding operation for feeding a sheet from the manual feed tray **46**A, vibration of the pad holder **72** caused when the sheet passes through the nip portion is reduced by the contact of the hemisphere portions **721**G with the inner wall parts **104**S. As a result, abnormal sound caused when the sheet passes through the nip portion is suppressed. In the present embodiment, as described above, the hemisphere portions **721**G are in contact with the inner wall parts **104**S in the sheet width direction. Therefore, the first holder portion **721** supporting the separation pad **71** is allowed to rotate around the rotation axis line CL with the hemisphere portions **721**G sliding along the inner wall parts **104**S while being in contact with the inner wall parts **104**S. Therefore, the first holder portion **721** is not fixed due to the contact of the hemisphere portions **721**G of the contact parts **721**E with the mount portion **100**S, thereby preventing formation of a nip portion from being hindered.

Additionally, when a sheet passes through the nip portion, dynamic frication force and static friction force might vary between the sheet feed roller **461**, the sheet, and the separation pad **71**. As a result, the rotation speed of the sheet feed roller **461** might vary. When the rotation speed of the sheet feed roller **461** varies, the first holder portion **721** including the separation pad **71** vibrates, and abnormal sound is likely to occur. In the present embodiment, however, as described above, even when a sheet passes through the nip portion, the hemisphere portions **721**G are in contact with the inner wall parts **104**S. Therefore, the rigidity of the first holder portion

721 is increased, and the above-mentioned vibration of the first holder portion 721 is suppressed. Further, also in this case, the first holder portion 721 is allowed to rotate around the rotation axis line CL with the hemisphere portions 721G sliding along the inner wall parts 104S while being in contact with the inner wall parts 104S. Therefore, the sheet is allowed to pass through the nip portion stably while maintaining the state where the hemisphere portions 721G are constantly in contact with the inner wall parts 104S. In other words, if rotation of the first holder portion 721 is hindered by the contact of the hemisphere portions 721G with the inner wall parts 104S, the sheet feeding performance at the nip portion is degraded. On the other hand, in the present embodiment, since the direction in which the hemisphere portions 721G contact the wall parts 104S is the sheet width direction, rotation of the first holder portion 721 is prevented from being hindered. The contact parts 721E may be disposed on the second holder portion 722 side. On the other hand, when the contact parts 721E are disposed on the first holder portion 721 side like the separation pad 71 as in the present embodiment, vibration caused when a sheet passes through the nip portion is efficiently reduced before being transferred to the other members.

Further, in the present embodiment, rotation of the first holder portion 721 realizes movement of the contact part 721E. Then, the pad holder 72 changes its posture from the first posture to the second posture while the hemisphere portions 721G frictionally slide on the inner wall parts 104S. Therefore, the hemisphere portions 721G are allowed to stably contact the inner wall parts 104S before the pad holder 72 reaches the second posture. At this time, the extending portions 721F are elastically deformed with the hemisphere portions 721G being free ends, whereby the hemisphere portions 721G can smoothly move while being in contact with the inner wall parts 104S. In addition, during the sheet feeding operation, vibration caused when a sheet passes through the nip portion is likely to be absorbed by the elastic deformation of the extending portions 721F.

Further, in the present embodiment, the hemispherical shape of the hemisphere portion 721G reduces sliding resistance when the hemisphere portions 721G frictionally slide on the inner wall parts 104S. In addition, an elastic force caused by the elastic deformation of the extending portions 721F allows the hemisphere portions 721G to stably contact the inner wall parts 104S.

In the first posture of the pad holder 72 shown in FIG. 10, it is desired that the hemisphere portions 721G are disposed slightly outside with respect to the inner wall parts 104S in the sheet width direction. In other words, in the first posture, the interval between the pair of hemisphere portions 721G in the sheet width direction is desirably set to be slightly larger than the interval between the pair of inner wall parts 104S. In this case, after the circumferential surface of each hemisphere portion 721G contacts a right-side edge of the inner wall part 104S with rotation of the first holder portion 721, the hemisphere portion 721G frictionally slides on the inner wall part 104S while the extending portion 721F elastically deforms inward in the sheet width direction. Accordingly, contact of the hemisphere portion 721G with the inner wall part 104S is reliably and smoothly realized.

In addition, in the present embodiment, with the change in the posture of the pad holder 72 to the second posture, the outer circumferential surface 720A of each cylindrical part 720 is pressed against (comes into contact with) the wall surface 102A of the main body guide piece 102 in the rightward direction (refer to FIG. 16). In other words, after the pad holder 72 is mounted to the mount portion 100S, the cylindrical part 720 disposed beneath the separation pad 71 is brought into contact with the wall surface 102A of the main body guide pieces 102 in the rightward direction, by utilizing a reaction force of a force caused when the sheet feed roller 461 presses the separation pad 71 supported by the pad holder 72 downward and leftward. Therefore, vibration caused when a sheet passes through the nip portion during the sheet feeding operation is further reduced by the contact of the pad holder 72 with the main body guide pieces 102. As a result, occurrence of abnormal sound caused when a sheet passes through the nip portion is further suppressed. Particularly, in the present embodiment, the outer circumferential surface 720A of the cylindrical parts 720 contact the wall surfaces 102A of the main body guide pieces 102. Therefore, each outer circumferential surface 720A comes into point-contact with the wall surface 102A when viewed at a cross section intersecting the cylindrical axis of the cylindrical part 720. As a result, the outer circumferential surfaces 720A can reliably contact the wall surface 102A. Further, contact of the pad holder 72 with the main body guide pieces 102 allows the position of the separation pad 71 to be stably maintained. As a result, the position of the nip portion between the separation pad 71 and the sheet feed roller 461 is less likely to change, and thus the manually-fed-sheet conveying path 460 is stably maintained.

Furthermore, in the present embodiment, the cylindrical parts 720 are disposed on the first holder portion 721 side of the pad holder 72, while the guide pieces 723 are disposed on the second holder portion 722 side. Accordingly, even in the pad holder 72 composed of two plate-shaped members being combined, the guide members (the cylindrical parts 720 and the guide pieces 723) are disposed on both the first holder portion 721 and the second holder portion 722, and thus mounting/removal of the pad holder 72 is realized more stably.

The manual sheet feed portion 46 (manual feed tray 46A) according to the embodiment of the present disclosure and the image forming apparatus 1 including the manual sheet feed portion 46, have been described. In the image forming apparatus 1, an image can be stably formed on a sheet while suppressing abnormal sound caused when the sheet passes through the nip portion. However, the present disclosure is not limited thereto. For example, the following modifications are also within the scope of the present disclosure.

In the above embodiment, the manual feed tray 46A is used as a sheet tray, and the manual sheet feed portion 46 is used as a sheet feed apparatus. However, the present disclosure is not limited thereto. The present disclosure may be applied to an automatic document feeder 20 (sheet feed apparatus) as a sheet feed apparatus that conveys a sheet as a document sheet. In this case, an image reading apparatus 2 is constituted by the reading unit 25 (reading portion) and the automatic document feeder 20. The reading unit 25 is disposed facing the sheet conveying path extending from the document tray 21 (sheet stacking portion). A sheet feed roller, a separation pad 71, and a pad holder 72, similar to those of the above embodiment, are disposed in the document conveying portion 22 of the automatic document feeder 20. Also in this case, the pad holder 72 supporting the separation pad 71 is smoothly mounted to a predetermined mount portion. Further, vibration caused when a document sheet passes through a nip portion during a sheet feeding operation for feeding the document sheet from the document tray 21 is preferably suppressed by contact of a not-illustrated contact part with the mount portion. As a result, an image on the document sheet can be stably read while abnormal sound caused when the document sheet passes through the nip portion is suppressed.

In the above embodiment, a portion of the contact part **721**E, which contacts the inner wall part **104**S, has a hemispherical shape. However, the present disclosure is not limited thereto. The contact part may have another shape. When the contact part **721**E has a wedge shape tapered toward the rotation direction of the first holder portion **721**, contact of the wedge-shaped contact part with the inner wall part **104**S prevents vibration of the pad holder **72** and occurrence of abnormal sound.

It is to be understood that the embodiments herein are illustrative and not restrictive, since the scope of the disclosure is defined by the appended claims rather than by the description preceding them, and all changes that fall within metes and bounds of the claims, or equivalence of such metes and bounds thereof are therefore intended to be embraced by the claims.

The invention claimed is:

1. A sheet feed apparatus comprising:

a casing;

a sheet stacking portion provided in the casing, in which sheets are stacked;

a sheet conveying path through which the sheets stacked in the sheet stacking portion are conveyed in a predetermined sheet conveying direction;

a sheet feed roller provided in the casing so as to face a downstream side of the sheet stacking portion in the sheet conveying direction, and configured to convey the sheets in the sheet conveying direction;

a separation pad provided facing the sheet feed roller, and configured to form, with the sheet feed roller, a nip portion through which the sheets pass, and convey the sheets one by one in the sheet conveying direction;

a holder configured to fix and support the separation pad;

a mount portion provided in the downstream side from the sheet stacking portion in the sheet conveying direction in the casing, to and from which the holder is mountable and removable; and

an urging member configured to urge the separation pad toward the sheet feed roller via the holder being in a mounted state where the holder is mounted to the mount portion, wherein

the holder is configured to be changeable in its posture between a first posture and a second posture, the first posture being a posture in which the separation pad is spaced apart from the sheet feed roller so as to release the nip portion while the holder is in the mounted state, and the second posture being a posture in which the nip portion is formed between the separation pad and the sheet feed roller while the holder is in the mounted state,

the holder includes a contact part that contacts the mount portion when the holder is in the second posture, and is spaced apart from the mount portion when the holder is in the first posture,

the mount portion includes an inner wall which defines a mount space in which the holder is mounted, and faces the holder in a sheet width direction intersecting the sheet conveying direction,

when the holder is in the second posture, the contact part comes into contact with the inner wall;

the holder includes:

a first supporting plate supporting the separation pad; and

a second supporting plate mounted to the mount portion, and rotatably supporting the first supporting plate,

the urging member is compressed and disposed between the first supporting plate and the second supporting plate,

the first supporting plate includes, at a lower end thereof, a hole opened facing the sheet width direction,

the second supporting plate includes, at a lower end thereof, a shaft which extends in the sheet width direction and can be inserted in the hole, and

when the shaft is inserted in the hole, the first supporting plate becomes rotatable around the shaft as a rotation axis with respect to the second supporting plate, and

the contact part is disposed on the first supporting plate.

2. The sheet feed apparatus according to claim **1**, wherein

the sheet feed roller is mountable and removable in the casing,

the first posture of the holder is a state where a distance between the first supporting plate and the second supporting plate around the rotation axis is greatest due to an urging force of the urging member, and

when the holder is mounted in the mount space and the sheet feed roller is mounted to the casing, the first supporting plate rotates around the shaft as a rotation axis so as to come close to the second supporting plate, against the urging force of the urging member, whereby the posture of the holder is changed from the first posture to the second posture.

3. The sheet feed apparatus according to claim **2**, further comprising:

a cylindrical part provided so as to project in the sheet width direction from a portion of the holder lower than the separation pad, and including an outer circumferential surface; and

a guide member disposed, in the mount portion, between the holder and the sheet stacking portion, including a wall surface extending in an up-down direction and facing the holder, and configured to guide the holder to the mount space, wherein

the holder is mounted in the mount space while the outer circumferential surface of the cylindrical part is guided by the wall surface of the guide member, and when the holder is in the second posture, the outer circumferential surface of the cylindrical part is pressed against the wall surface.

4. The sheet feed apparatus according to claim **2**, wherein

the casing includes, in a region above the mount portion, a housing having a storage space in which the sheet feed roller is stored, and supporting the sheet feed roller,

the sheet feed roller is mounted in and removed from the storage space of the housing via an upper portion of the storage space, and

the holder is mounted to and removed from the mount portion via the storage space from which the sheet feed roller has been removed.

5. The sheet feed apparatus according to claim **2**, wherein

the holder further includes a guide plate provided so as to projects from the second supporting plate in the sheet width direction, and

the mount portion further includes a guide groove in which the guide plate is inserted.

6. The sheet feed apparatus according to claim **1**, wherein

the contact part includes:

an extending portion provided so as to project from an end of the first supporting plate in the sheet width direction toward the second supporting plate side, the extending portion being elastically deformable in the sheet width direction; and

a projecting portion provided so as to project from a front end of the extending portion in the sheet width direction, the projecting portion being in contact with the inner wall, and

when the holder is in the second posture, the first supporting plate rotates around the shaft as a rotation axis while the projecting portion frictionally slides on the inner wall, with passing of the sheets through the nip portion.

7. The sheet feed apparatus according to claim **6**, wherein the projecting portion has a hemispherical shape.

8. An image forming apparatus comprising:

the sheet feed apparatus according to claim **1** configured to convey the sheet; and

an image forming portion provided in the casing, and configured to form an image on the sheet conveyed by the sheet feed apparatus.

9. An image reading apparatus comprising:

the sheet feed apparatus according to claim **1** configured to convey the sheet as a document sheet; and

a reading portion provided facing the sheet conveying path, and configured to read an image on the document sheet.

10. A sheet feed apparatus comprising:

a casing;

a sheet stacking portion provided in the casing, in which sheets are stacked;

a sheet conveying path through which the sheets stacked in the sheet stacking portion are conveyed in a predetermined sheet conveying direction;

a sheet feed roller provided in the casing so as to face a downstream side of the sheet stacking portion in the sheet conveying direction, and configured to convey the sheets in the sheet conveying direction;

a separation pad provided facing the sheet feed roller, and configured to form, with the sheet feed roller, a nip portion through which the sheets pass, and convey the sheets one by one in the sheet conveying direction;

a holder configured to fix and support the separation pad;

a mount portion provided in the downstream side from the sheet stacking portion in the sheet conveying direction in the casing, to and from which the holder is mountable and removable; and

an urging member configured to urge the separation pad toward the sheet feed roller via the holder being in a mounted state where the holder is mounted to the mount portion, wherein

the holder is configured to be changeable in its posture between a first posture and a second posture, the first posture being a posture in which the separation pad is spaced apart from the sheet feed roller so as to release the nip portion while the holder is in the mounted state, and the second posture being a posture in which the nip portion is formed between the separation pad and the sheet feed roller while the holder is in the mounted state,

the holder includes a contact part that contacts the mount portion when the holder is in the second posture,

the mount portion includes an inner wall which defines a mount space in which the holder is mounted, and faces the holder in a sheet width direction intersecting the sheet conveying direction,

when the holder is in the second posture, the contact part comes into contact with the inner wall,

the holder includes:

a first supporting plate supporting the separation pad; and

a second supporting plate mounted to the mount portion, and rotatably supporting the first supporting plate,

the urging member is compressed and disposed between the first supporting plate and the second supporting plate,

the first supporting plate includes, at a lower end thereof, a hole opened facing the sheet width direction,

the second supporting plate includes, at a lower end thereof, a shaft which extends in the sheet width direction and can be inserted in the hole, and

when the shaft is inserted in the hole, the first supporting plate becomes rotatable around the shaft as a rotation axis with respect to the second supporting plate, and

the contact part is disposed on the first supporting plate.

11. The sheet feed apparatus according to claim **10**, wherein

the sheet feed roller is mountable and removable in the casing,

the first posture of the holder is a state where a distance between the first supporting plate and the second supporting plate around the rotation axis is greatest due to an urging force of the urging member, and

when the holder is mounted in the mount space and the sheet feed roller is mounted to the casing, the first supporting plate rotates around the shaft as a rotation axis so as to come close to the second supporting plate, against the urging force of the urging member, whereby the posture of the holder is changed from the first posture to the second posture.

12. The sheet feed apparatus according to claim **11**, further comprising:

a cylindrical part provided so as to project in the sheet width direction from a portion of the holder lower than the separation pad, and including an outer circumferential surface; and

a guide member disposed, in the mount portion, between the holder and the sheet stacking portion, including a wall surface extending in an up-down direction and facing the holder, and configured to guide the holder to the mount space, wherein

the holder is mounted in the mount space while the outer circumferential surface of the cylindrical part is guided by the wall surface of the guide member, and when the holder is in the second posture, the outer circumferential surface of the cylindrical part is pressed against the wall surface.

13. The sheet feed apparatus according to claim **11**, wherein

the casing includes, in a region above the mount portion, a housing having a storage space in which the sheet feed roller is stored, and supporting the sheet feed roller,

the sheet feed roller is mounted in and removed from the storage space of the housing via an upper portion of the storage space, and

the holder is mounted to and removed from the mount portion via the storage space from which the sheet feed roller has been removed.

14. The sheet feed apparatus according to claim **11**, wherein

the holder further includes a guide plate provided so as to projects from the second supporting plate in the sheet width direction, and

the mount portion further includes a guide groove in which the guide plate is inserted.

15. The sheet feed apparatus according to claim **10**, wherein

the contact part includes:

an extending portion provided so as to project from an end of the first supporting plate in the sheet width direction toward the second supporting plate side, the extending portion being elastically deformable in the sheet width direction; and

a projecting portion provided so as to project from a front end of the extending portion in the sheet width direction, the projecting portion being in contact with the inner wall, and

when the holder is in the second posture, the first supporting plate rotates around the shaft as a rotation axis while the projecting portion frictionally slides on the inner wall, with passing of the sheets through the nip portion.

16. The sheet feed apparatus according to claim **15**, wherein the projecting portion has a hemispherical shape.

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